STOPPING WATER POLLUTION AT ITS SOURCE

MISA
Municipal/Industrial Strategy for Abatement

Inventory and Critical Review of Laboratory Resources Final Report

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INVENTORY AND CRITICAL REVIEW OF LABORATORY RESOURCES - FINAL REPORT

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ABTRACT

This report provides an inventory and critical review of the analytical laboratory resources available to service the Municipal and Industrial Strategy for Abatement (MISA) program. The review is based on a mail survey of 433 laboratories from accross Canada and the Northeastern United States, followed by on-site visits at 35 of 94 laboratories that indicated an ability to serve Ontario industry under the program.

The report provides an inventory of the laboratories polled as well as a critical review of areas of adequate and inadequate support for the MISA program.

This report does not provide an endorsement for any individual laboratory; neither does it provide a detailed review of individual or overall data quality.

LISTE ET EXAMEN CRITIQUE DES LABORATOIRES

SOMMAIRE

Le présent rapport renferme un inventaire et un examen critique des services d'analyse qu'offrent les laboratoires et dont on pourrait se servir pour la Stratégie municipale et industrielle de dépollution (SMID). L'examen a été effectué en deux étapes; on a d'abord envoyé un questionnaire à 433 laboratoires du Canada et du nord-est des États-Unis, puis on a visité 35 des 94 laboratoires qui avaient indiqué qu'ils pourraient répondre aux besoins des industries ontariennes dans le cadre de la SMID.

En outre, le rapport présente la liste des laboratoires qui ont reçu le questionnaire, ainsi qu'un examen critique des services qu'ils peuvent ou ne peuvent pas offrir.

Signalons toutefois qu'il ne s'agit pas ici de recommander l'un ou l'autre des laboratoires, ni de fournir une étude détaillée de la qualité des données recueillies par un laboratoire en particulier ou par l'ensemble des laboratoires.

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EXECUTIVE SUMMARY

The Inventory and Critical Review of Laboratory Resources is a survey of the capability and capacity of the laboratory industry in Canada and the northeastern United States to handle the analtyical requirements of the Municipal-Industrial Strategy for Abatement (MISA) program. The survey has determined:

° the analtyical capability of laboratories;

° QA/QC procedures and protocols in place or under development;

° the capacity of the industry to take on MISA analyses.

No assessment of the actual quality of lab analyses was conducted in this survey.

This Inventory and Critical Review of Laboratory Resources surveyed:

° 433 laboratories in Canada and the northeastern United States. Labs were surveyed from a broad range of industrial sectors:

- commercial labs
- consultants
- industrial labs
- crown corporations
- universities
- government
- municipal labs

° responses were received from 215 labs of which 94 were interested in MISA analyses.

The information collected from the 94 interested labs, as confirmed by detailed interviews with 35, was compiled onto a computerized data base and was used to assess the analytical capabilities, QA/QC practices and capacities of the lab industry in Canada. From this assessment the following primary conclusions can be reached.

° the Canadian laboratory industry should have sufficient capacity to meet the analytical requirements of MISA;

° there is a broad based capability to analyze 'water quality' and 'inorganic' parameters. Organics analysis capabilities are not as wide spread.

° quality assurance/quality control procedures at many labs are in transition.

- routine QC sample analyses is well in place across the industry.

- objective assessment of QC data and documented QA/QC protocols are in place or under development at many Canadian labs.

From these conclusions the following recommendations have been made:

° efforts should be taken by both industry (using labs) and government to ensure that MISA analyses are spread across the interested lab sector and are conducted with adequate quality.

- the Inventory and Critical Review of Laboratory Resources should be updated on a regular basis.

INVENTORY AND CRITICAL REVIEW OF LABORATORY RESOURCES

1. INTRODUCTION

1.1 Background

The Municipal-Industrial Strategy for Abatement (MISA) is an extensive program under development by the Ontario Ministry of the Environment (MOE). The goal of MISA is the improvement of surface water quality in Ontario through "the virtual elimination of toxic contaminants in municipal and industrial discharges into waterways"[1].

MISA will be implemented through two regulatory actions. Initially industry will be required to monitor effluent in a detailed year long program to determine effluent discharge quality. The emphasis of the monitoring program will be on toxic contaminants. This monitoring program will produce a data base of effluent quality which can be related to industrial sectors and the treatment technology that has been used by an industry sector. Based on that data a second monitoring program will be mandated by regulation; in this second case monitoring will be less detailed (in frequency and parameter list). This long-term monitoring program will consider toxic contaminants produced by an industry sector and the Best Available Technology (Economically Achievable) (BATEA) which can be used to treat industrial discharges.

1.2 Laboratory Resources Survey

As an integral part of MISA regulation development, MOE has involved public and industry advisory groups. These groups expressed concern about the large chemical analysis require-

ment of the MISA regulations. Industry groups indicated that they were not aware of a large number of analytical laboratories in Canada and the United States that could undertake the type and volume of analysis implied by proposed regulations. Experts in the laboratory analysis field were also unsure of the capabilities and capacity of laboratories with respect to MISA. As such, the MOE undertook a survey of laboratory capability in Canada and bordering American states. The purposes for the survey were:

- to identify to industries, a list of laboratories capable of carrying out MISA analysis; and

- to assess shortfalls, if any, in the capability, capacity and/or quality of laboratories in undertaking MISA analysis.

M.M. Dillon Limited was retained by MOE to conduct this inventory and assessment of laboratories. The study was carried out in three phases:

- Phase 1 - to identify and survey laboratories which may be capable of underaking MISA analyses and develop a short-list of laboratories.

- Phase II - to confirm, through on-site visits, the capabilities of the short-listed laboratories.

- Phase III - to assess the capabilities and capacities of laboratories to undertake MISA analyses.

The results of this study are summarized in this report. As well, the detailed information collected for each of the laboratories surveyed has been compiled onto a computerized data base using dBASE III PLUS software. This data has been forwarded to the MOE, separately, as well as a User's Manual detailing methods to access data base information.

The methodology used for, and the results of the MOE Laboratory Resources Survey are presented in the following sections. The capability of the laboratories to undertake MISA analysis is discussed in general terms. Capability has been assessed according to:

- the ability of laboratories to analyze MISA parameters;

- quality assurance activities carried out by the laboratories;

- capacity, both current and anticipating future expansion, for analyzing water quality, inorganic and organic MISA parameters.

2. METHODOLOGY

The survey was carried out in three phases using two questionnaires. In the first phase, a long-list of laboratories potentially capable of MISA analysis were surveyed, by mail, using a brief 'Screening Questionnaire'. The results of this mail-out survey were used to select a short-list of 35 laboratories. The 35 laboratories were visited on-site to verify the information collected in the screening questionnaire and obtain more detailed information. Their laboratory facilities were toured, as well. These on-site visits comprised Phase II of the survey. The information obtained from both the screening and detailed surveys was compiled onto a computerized, laboratory specific, data base. Finally, the information obtained from the surveyed laboratories has been assessed to determine if they currently have sufficient capability and capacity to meet proposed MISA requirements.

2.1 Laboratory Selection

As discussed above, a 'long-list' of laboratories was selected for mail-out survey. It was decided to survey all laboratories identified as being capable of 'chemical analysis' rather than being more selective. This was done so that no laboratories, potentially capable of MISA analyses, would be omitted accidentally from the initial survey. Laboratories were selected, for survey, from all across Canada, and the northeastern United States. The survey list of Canadian labs was reasonably exhaustive. The American labs surveyed, however, were selected to give a picture of high production U.S. lab capabilities.

A total of 433 laboratories were selected to be contacted in the mail survey. The listing of laboratories was derived from a number of sources. These sources included laboratories that Dillon and the MOE were aware of; Science Procurement Information Network (SPIN) listings supplied by the Federal Department of Supply and Services; and listings provided by Dillon staff in our offices across Canada. As well, American laboratories were selected from the ASTM Directory of Testing Laboratories. The majority of the labs selected are in Ontario but a number of labs in the rest of Canada and the northeastern United States are also included.

The labs have been classified into seven industrial sectors. They have been identified with unique alpha-numeric identifier codes. The letters in the codes designate the sector of the laboratories' activity as follows:

- CL - Commercial Laboratories
- CS - Consultants
- I - Industries
- CR - Crown Corporations
- U - Universities
- G - Government
- ML - Municipal Laboratories

A listing of the labs contacted with their sector codes and locations is included in Appendix A.

2.2 Questionnaire Development

Two questionnaires were developed for use in the survey. The first, a screening questionnaire, was submitted by mail and was to be completed by all laboratories contacted. It requested general information in the areas of:

- analytical capability;
- physical facilities;
- quality assurance and quality control;
- laboratory personnel;
- fees;
- clientele;
- sampling assistance.

The screening questionnaire was designed to be brief, to allow for its completion, by as many labs as possible, with a minimum of time and effort. It also requested information that would be valuable to industry and could be used to assess, in general, the MISA capability of all labs that responded to the mail survey.

The second, more detailed questionnaire was developed as a basis for information to be obtained from the short-list of labs during the site visits.

The detailed questionnaire reiterated the questions asked in the screening questionnaire, to verify responses as well as requesting specific information on:

- analytical methodology;
- quality assurance and quality control (QA/QC) procedures;
- sample throughput and analytical capacity; and
- staff training.

It was included in the mail-out package for information purposes, as a means of informing the labs of the scope of information sought in the survey.

The detailed questionnaire was administered to 35 labs during personal on-site interviews in July/August 1987.

The mail-out also included introductory letters from both the Ministry of the Environment and Dillon as well as a 'schedule' of the analytical requirements of MISA to the laboratories. The schedule used for the survey was the most up-to-date indication at the time of mailing, of the analytical parameters, detection limits and methodologies that would be required under MISA. The list of analytical parameters, for which capability information was requested in the survey, is not identical to the list published in 'The Effluent Monitoring Regulation for the Petroleum Refining Sector (Draft)', July 1987. As such, the schedule of chemical parameters, submitted with the survey questionnaire, has been used as the basis for chemical analysis capability in this study. A copy of this schedule and both questionnaires, with accompanying letters, is included in Appendix B.

2.3 Laboratory Shortlisting

Ninety-four laboratories gave positive responses, indicating capability and interest in doing MISA analysis, to the mail-out survey. It was considered optimal to conduct on-site visits at approximately 35 laboratories. Therefore, a method of creating a short-list of labs for on-site visits was developed. All responses from laboratories that were received prior to July 1, 1987, were considered for short-listing.

As questionnaire results were received they were reviewed and divided into three categories, based on the laboratory's analytical capability.

1. Extensive - Capable of performing most analyses required under MISA, with acceptable detection limits and QA/QC procedures.

2. Moderate - Capable of performing either inorganic or organic analysis with acceptable detection limits and QA/QC programs.

3. Marginal - Limited analytical capability.

The short-listed companies were selected, first, according to the extent of their analytical capability, and, secondly, the lab's geographic location. The survey team was interested in visiting labs all across Canada, as well as several in the U.S. A listing of the 35 laboratories that were selected for on-site visit and detailed interview are shown in Table 1.

TABLE 1
LABORATORIES SHORTLISTED FOR DETAILED INTERVIEW

Laboratory	Location	Analytical Capability
Barringer-Magenta Ltd.	Rexdale, Ontario	Extensive
Bondar-Clegg & Co.	Ottawa, Ontario	Moderate
Canpro Labs.	Toronto, Ontario	Extensive
Canviro Consultants	Kitchener, Ontario	Extensive
Clayton Environmental	Windsor, Ontario	Extensive
Diagnostic Research	Toronto, Ontario	Moderate
Eco Laboratories	Rockwood, Ontario	Moderate
Enviroclean	London, Ontario	Extensive
Forintek Canada	Ottawa, Ontario	Moderate
Guelph Chemical Labs.	Guelph, Ontario	Extensive
Mann Testing Labs	Mississauga, Ontario	Extensive
Microbe Inc.	London, Ontario	Extensive
Ontario Research Foundation	Mississauga, Ontario	Extensive
Peninsula Chemical Anal.	Niagara Falls, Ontario	Extensive
Pollutech Ltd.	Oakville, Ontario	Extensive
Queen's University	Kingston, Ontario	Moderate

TABLE 1
LABORATORIES SHORTLISTED FOR DETAILED INTERVIEW
(continued)

Laboratory	Location	Analytical Capability
Technical Services Lab.	Mississauga, Ontario	Extensive
Thunder Bay Analytical	Thunder Bay, Ontario	Moderate
Walker Brothers Ind.	St. Catharines, Ont.	Moderate
Wellington Environmental	Guelph, Ontario	Moderate
Zenon Environmental	Burlington, Ontario	Extensive
Novalabs	Montreal, Quebec	Moderate
Technitrol Canada	Montreal, Quebec	Extensive
Research & Productivity Council	Fredericton, N.B.	Extensive
Seatech Investigations	Halifax, Nova Scotia	Moderate
Ind. Tech. Centre, Manitoba Research	Winnipeg, Manitoba	Moderate
Whiteshell Nuclear Res. Est.	Pinawa, Manitoba	Moderate
Chemex Labs.	Calgary, Alberta	Extensive
Enviro-Test/Norwest	Edmonton, Alberta	Extensive
ASL Analytical Service Lab.	Vancouver, B.C.	Extensive
British Columbia Research	Vancouver, B.C.	Extensive
CompuChem Laboratories	Chapel Hill, N.C.	Extensive
ETC	Edison, N.J.	Extensive
Galson Technical	Syracuse, N.Y.	Extensive
Syracuse Research Corp.	Syracuse, N.Y.	Extensive

As can be seen from Table 1, the majority of labs visited for detailed survey are located in Ontario (21). The majority of these laboratories (13) are extensively capable, in that they are capable of analyzing the majority of MISA parameters. The others were selected according to the lab's location, specialized capabilities, industrial sector and the ability of the lab to service a specific industrial sector. For example:

- Thunder Bay Analytical Laboratories was the only laboratory located in Northern Ontario that indicated MISA capability (inorganics only).

- Forintek Canada, had moderate MISA capability. They indicated, however, that they provided specialized services to the wood and wood processing industries;

- Wellington Environmental and Bondar-Clegg had capabilities for analyzing organics and inorganics respectively.

- Queen's University was one of three university labs that indicated, as of January 1987, interest in doing MISA analysis.

Laboratories outside of Ontario were selected for on-site survey according to their analytical capability and geographic location. However, the study team was constrained so that fewer laboratories in isolated geographic locations were visited. A description of the capabilities and locations of laboratories that were not selected for on-site survey is shown in Appendix C. The majority of laboratories that were not selected have only marginal MISA capability. As well, laboratories that have multiple locations, across Canada and/or the U.S., were visited at one location only.

2.4 Detailed Interviews

During July and August 1987, the 35 labs identified in Section 2.3 were interviewed on-site by a multi-disciplinary survey team. The survey team was comprised of:

- a representative of Dillon;

- a quality assurance/quality control (QA/QC) expert from the Laboratory Services Branch of MOE;

- a MOE Laboratory Services Branch representative familiar with MISA analytical requirements.

The on-site interviews typically lasted three to four hours. Questions from the detailed questionnaire were discussed with laboratory managers and QA/QC personnel (if available). The discussion was followed by a lab tour during which equipment, methods used, housekeeping practices, etc. were visually assessed by the survey team. No QA/QC 'check samples' were submitted to the laboratories as a part of this survey. Therefore, the overall or ongoing quality of the analytical results from the laboratories could not be evaluated.

2.5 Data Base Development

All information obtained from both the 'screening' survey and the detailed interviews has been compiled onto a computerized data base using dBASE III PLUS software. The information obtained from the labs was interpreted by the Dillon study team prior to computer input. Efforts were also taken to ensure that data base information was consistent from lab to lab. For example, all analytical costs in the data base are reported in Canadian dollars. Costs reported in U.S. dollars have been factored by 1.3 for the purposes of the data base and this report.

Information on the following is contained in the six data bases developed:

- laboratory name, location and contact personnel;
- analytical capability, costs, turnaround times;
- analytical methodology;
- capacity;
- quality assurance and quality control procedures and documentation;
- general information about lab size, staffing, sampling, etc.

The data base contains only factual information as submitted by the labs and confirmed by the study team. The information contained on the data base was sent to the responding labs, in December 1987 for their review and comment. All modifications submitted by the labs have been input to the data base.

A detailed description of the information contained in the computer data base is given in Section 3.

3. SURVEY RESULTS

3.1 Questionnaires/Responses

A total of 433 questionnaires were sent to laboratories in Canada and the United States. Responses have been received from 215 labs, and twenty-six of the surveys sent out were returned by the post office because of unknown address. All returned surveys were checked and were resubmitted to the correct address if it could be found. The twenty-six with unknown addresses have been removed from the data base and all further discussions of survey results. The response rate based on valid address was 215/407 or 53%.

3.1.1 Negative Responses

Of the 215 labs that responded to the mail-out questionnaire, 121, or 56%, expressed that they were not interested in participating in the survey.

These labs have been broken out both geographically as shown in Table 2.

They are listed in Tables D-1 through D-7 in Appendix D, along with brief descriptions of the reasons given for not participating in this survey.

Commercial labs which were not interested in participating tended to be geotechnical, biological or diagnostic laboratories not capable of performing MISA type chemical analysis. The majority of the consultants who responded that they will not be participating, did not have laboratory facilities. Industrial and municipal labs commonly indicated that they

TABLE 2

NEGATIVE RESPONSES BY SECTOR AND LOCATION

Country	NUMBER OF NEGATIVE RESPONSES (%)								
	C A N A D A								U.S.A.
Province	Ontario	British Columbia	Alberta	Saskatchewan	Manitoba	Quebec	New Brunswick	Nova Scotia	
Commercial Labs	17 (14%)	3 (2%)	3 (2%)	1 (1%)	0	4 (3%)	0	1 (1%)	6 (5%)
Consultants Labs	7 (6%)	1 (1%)	3 (2%)	0	0	3 (2%)	1 (1%)	3 (2%)	0
Industry Labs	18 (15%)	1 (1%)	2 (2%)	1 (1%)	1 (1%)	13 (11%)	0	2 (2%)	2 (2%)
Crown Labs	1 (1%)	0	0	0	2 (2%)	1 (1%)	0	0	0
University Labs	4 (3%)	0	1 (1%)	1 (1%)	0	1 (1%)	1 (1%)	3 (2%)	0
Government Labs	3 (2%)	2 (2%)	0	0	1 (1%)	0	0	2 (2%)	0
Municipal Labs	4 (3%)	0	0	0	1 (1%)	0	0	0	0

performed in-house analysis only or were unable to do MISA type analysis. Government labs indicated that they were not interested in competing with the private sector. These reasons again are summarized in Appendix D.

3.1.2 Interested Responses

A total of 94 labs, or 44% of the total responses, expressed an interest in doing analysis for industry under the MISA program. The names, addresses and contact information for these labs are given in Table E-1 through E-6, in Appendix E. They can be, again, broken down geographically and by industrial sector as shown in Table 3.

As expected, the majority of the labs interested in performing MISA analysis are commercial labs. No government labs were interested in participating in this survey or MISA analyses.

The information received from the 94 laboratories that responded favourably to the 'screening questionnaire' has been compiled onto the computerized data base. As well, the more detailed information collected from the 35 short-listed labs, identified in Section 2.3, has been placed in the data base. A description of the information contained in the computerized data base is presented below.

3.2 Data Base Description

The computerized data base to the Laboratory Resources Survey has been developed as a series of six data files. The parent data file to the data base is 'ADDLIST'. A brief description of the data files follows.

TABLE 3

PARTICIPATING LABS BY SECTOR AND LOCATION

Country	NUMBER OF PARTICIPATING LABS (%)								
	CANADA								U.S.A.
Province	Ontario	British Columbia	Alberta	Saskatchewan	Manitoba	Quebec	New Brunswick	Nova Scotia	
Commercial Labs	20 (21%)	1 (1%)	4 (4%)	0	0	3 (3%)	0	0	7 (8%)
Consultants Labs	11 (12%)	0	0	0	0	4 (4%)	0	1 (1%)	2 (2%)
Industry Labs	11 (12%)	0	0	0	0	3 (3%)	0	0	2 (2%)
Crown Labs	2 (2%)	2 (2%)	1 (1%)	1 (1%)	3 (3%)	0	1 (1%)	0	0
University Labs	2 (2%)	0	0	0	0	1 (1%)	0	0	0
Government Labs	0	0	0	0	0	0	0	0	0
Municipal Labs	12 (13%)	0	0	0	0	0	0	0	0

ADDLIST - Meaning Address List, contains name, address and contact information for each of the 407 laboratories contacted in the Laboratory Resources Survey. Each laboratory is identified by a unique alpha-numeric identifier code (see Section 2.1).

All of the remaining data files contain only information obtained from the 94 laboratories interested in conducting MISA analysis. All data files are connected and identified by the unique identifier code, or ID_CODE, for the laboratory of interest. A list of the ID codes for the laboratories surveyed is shown in Appendix A. A brief description of the laboratory specific information that is contained in the remaining five data files is shown below. A detailed description of the data base files, including instructions on their use, will be presented as a separate volume to this report.

CHEMCAP - The Chemical Capability data file identifies:

- Whether the laboratory is capable of analyzing a MISA parameter or analytical group.
- The turnaround time for completing an analysis, both routinely and under emergency situations.
- The analytical detection limits that can be attained for each parameter.
- The fees for each analysis. Fee information has been used to generate an overview of fee ranges. Specific laboratory fees have, however, been assigned 'third party' confidential status.

Chemcap contains information obtained from the 94 laboratories that responded to the 'screening' questionnaire.

METHODS - The Methods data file describes the analytical methods used by the 35 shortlisted labs. Methods are described in general terms for MISA parameter groups.

QA_QC - The Quality Assurance/Quality Control data file describes QA/QC activities and documentation in place at the 35 short-listed labs.

CAPACITY - The Capacity data file describes the number of samples/week that the 35 short-listed labs have estimated they can handle, presently, and with anticipated future expansion. This information has been used to generate a summary overview of laboratory capacity in Canada. Individual laboratory capacities have however been assigned 'third party' confidential status.

GENERAL - The General data file contains miscellaneous information about the laboratories. It contains information on:

- o laboratory size
- o staffing
- o sample matrices that the laboratory can handle
- o clientele served
- o sampling services

'General' contains information from all 94 laboratories.

The data base has been created as six data files partly due to constraints within the dBASE III PLUS software which allows only 'so much' information to be contained in a single data file. As well the data files have been created to contain 'related' information about the lab, such as QA/QC, and to segregate confidential information, such as capacity, from the more broadly accessible information.

4. DATA ASSESSMENT

The purposes of this study were twofold:

- to determine whether laboratories were capable of undertaking chemical analysis required under the MISA program, and

- to assess any areas of shortfall in analytical capability.

As such, all information obtained from the 94 laboratories, interested in conducting MISA analyses, has been assessed to determine the labs' analytical capabilities and any associated shortfalls.

The assessment will present an overview of laboratory capability in Canada and the northeastern U.S. based on the responses of the 94 laboratories as confirmed by site visits to 35 of the laboratories. The assessment of individual laboratory capabilities has been done as objectively as possible. No subjective impressions of individual laboratory capabilities will be given.

The survey team have compiled some subjective opinions on individual labs, particularly the 35 labs that were surveyed in detail. This information will be kept completely confidential and will not be released publicly. The MOE may, however, be sending letters to each of the 35 labs surveyed in detail. These letters will document the survey teams' impressions of the lab in the context of potential users of their analytical services.

For assessment purposes 'analytical capability' can be divided into three distinct components:

- Does the laboratory have the equipment, methodology and staff to enable them to analyze for a specific MISA parameter or MISA group?

- Does the laboratory have a QA/QC management program to ensure the quality of the analytical data they produce?

- Do laboratories have sufficient capacity to undertake the volume of analysis that will be generated under the MISA program?

A review of the survey responses indicated that capabilities could be grouped under three broad analytical categories:

Water Quality Analysis - using wet chemical or automatic colorimetric or titrimetric techniques (MISA Groups 1-8 and 11, 14).

Metals Analysis - using Atomic Absorption (AA) or Plasma (ICP) instrumentation (MISA Groups 9, 10, 12, 13).

Organics Analysis - using gas chromatography (GC) and/or gas chromatography - mass spectrometry (GC-MS) (MISA Groups 16-27).

A listing of the MISA parameters that fall under each of these headings is shown in Table 4. The analytical capabilities of the laboratories surveyed are discussed below, primarily under these three headings.

TABLE 4
PARAMETER GROUPINGS

Water Quality	Metals	Organics
Chemical Oxygen Demand	Total Metals	Halogenated Volatiles
Cyanide	Arsenic	Non-Chlorinated Volatiles
Hydrogen Ion (pH)	Mercury	Water Soluble Volatiles
Nitrogen Compounds		Base-Neutral Extractables
Organic Carbon		Acid Extractables
Total Phosphorus		Organochlorine Pesticides
Specific Conductance		PCDDs, PCDFs
Total Suspended Solids		Fatty and Resin Acids
Chromium VI		Oil and Grease
Phenolics		PCBs
		Alkyl Leads

4.1 Analytical Capability

The chemical analysis capabilities of the 94 laboratories surveyed are shown in Table 5. The capabilities are detailed for each laboratory according to 'MISA group'. Please refer to the 'Effluent Monitoring Regulation for the Petroleum Refining Sector' (Draft), July 1987 for a definition of the 'MISA groups'. The capabilities in Table 5 are shown as: 'yes', 'partial', 'no' or 'sub'.

Yes - indicates that the laboratory is capable of analyzing all parameters in the 'MISA group'

TABLE 5
LABORATORY CAPABILITY

NAME	Chemical Oxygen Demand (COD)	Cyanide	Hydrogen Ion (pH)	Nitrogen	Organic Carbon	Total Phosphorus	Specific Conductance	Total Suspended Solids (TSS)	Total Metals	Arsenic	Chromium VI	Mercury	Total Alkyl Lead	Phenolics (4AAP)	Volatiles, Halogenated	Volatiles, Non-Chlorinated	Volatiles, Water Soluble	Extractables, Base Neutral	Extractables, Phenolic Acid (Phenolics)	Extractables, Phenoxy Acid Herbicides	Extractables, Organochlorine Pesticides	Extractables, Neutral-Chlorinated	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	Oil and Grease (Solvent Extractables)	Fatty and Resin Acids	PCBs
ASL Analytical Svce. Lab. Ltd.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	partial	partial	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Accurassay Laboratories Ltd.	no	no	no	no	sub	no	no	no	no	no	no	no	sub	sub	sub	sub	sub	sub	sub	sub	sub	sub	sub	sub	sub	sub
Agri Service Lab Inc.	yes	yes	yes	yes	no	yes	yes	yes	partial	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Agri-Food Laboratories	no	no	yes	yes	partial	yes	yes	yes	partial	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	co	no	no
Alberta Fes Council,Coal Res.Centre	yes	yes	yes	yes	partial	yes	no	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
Analytical and Biological Labs	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Assayers Ontario Limited	yes	yes	yes	partial	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Atomic Energy of Canada Limited	no	no	yes	partial	yes	no	yes	no	yes	yes	yes	yes	no	no	no	no	no	no	no	no	yes	no	no	no	no	no
Barringer Magenta Limited	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Beacon Research Associates Ltd.	yes	no	yes	yes	no	yes	no	yes	partial	no	yes	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
Beak Analytical Services	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Bio-Research Laboratories Limited	no	no	yes	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Bondar-Clegg & Company Ltd.	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	yes	no	yes
British Columbia Hydro Research	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	partial	partial	no	partial	partial	yes	yes	partial	no	yes	yes	yes
British Columbia Research	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	partial	partial	no	partial	partial	yes	yes	partial	no	yes	yes	yes
CIL Explosives Technical Centre	no	no	yes	partial	partial	yes	yes	yes	partial	yes	no	no	no	no	no	no	no	partial	no	no	no	no	no	yes	no	yes
CS Environmental Laboratory, Inc.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes	yes	yes
Can. Food Prod. Dev. Centre - MRC	yes	no	yes	partial	no	no	no	yes	no	no	no	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
Canpro Laboratories	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	partial	yes	yes	yes	no	no	yes	yes	yes
Canviro Consultants Limited	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes
Carleton University, Chemistry Dept	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Chemex Labs Alberta (1984) Inc.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	partial	yes	yes	yes	partial	no	yes	no	yes
Chemical & Geological Laboratories	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no	yes	yes	yes	partial	yes	yes	yes	yes
Clayton Environmental Consultants	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
CompuChem Laboratories Inc.	sub	yes	yes	sub	sub	sub	sub	sub	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	no	no	yes	no	no
Conestoga-Rovers & Associates Ltd	yes	no	yes	yes	no	yes	yes	yes	partial	no	no	no	no	yes	no	no	no	no	no	yes	yes	yes	no	yes	yes	yes
Dearborn Chemical Co. Ltd.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	partial	partial	yes	yes	yes	yes	yes	no	yes	no	no
Dell Tech Chemical Corp.	no	no	yes	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
Diagnostic Research Laboratories	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	partial	no	no	yes
Dow Chemical Canada Inc.	no	no	yes	yes	yes	no	no	yes	partial	no	no	yes	no	no	yes	partial	partial	no	no	no	no	no	no	no	no	yes
ETC	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	no	no	no	no	yes
Easterly Water Treatment Plant	yes	no	yes	partial	no	yes	no	yes	partial	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Eco Laboratories Incorporated (ELI)	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes
Eldorado Resources Ltd.	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Enviro-Test Laboratories	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	partial	no	partial	yes	yes	yes	yes	no	yes	no	yes
Inviroclean Ltd.	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	no	yes	no
Forintek Canada Corp. Eastern Div	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Galson Technical Services, Inc.	yes	yes	yes	partial	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	yes	no	yes
Galt Testing Laboratories Ltd.	no	no	yes	no	no	yes	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Guelph Chemical Laboratories Ltd.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	yes	yes	yes	yes	partial	yes	no	no	no	no	no	yes	yes
Ind.Tech.Centre, Manitoba Research	no	yes	yes	partial	no	no	no	yes	partial	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	yes	no	yes
Island Water Treatment Plant	yes	no	yes	partial	no	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
J.T. Donald Consultants	yes	yes	yes	yes	no	yes	yes	yes	partial	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	yes	yes
London City Hall	no	yes	yes	yes	no	yes	yes	yes	partial	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	yes	no	yes
Mann Testing Laboratories	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes
Metro Toronto Industrial Waste Lab	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	no	no	yes	no	no	no	no	no	no	no	no	no	yes	yes	yes
Microte Incorporated	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes
Monenco Analytical Laboratories	yes	yes	yes	yes	partial	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	yes	no	yes
Morgan Schaffer Corporation	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no

TABLE 5
LABORATORY CAPABILITY

MISA CATEGORIES / NAME	Chemical Oxygen Demand (COD)	Cyanide	Hydrogen Ion (pH)	Nitrogen	Organic Carbon	Total Phosphorus	Specific Conductance	Total Suspended Solids (TSS)	Total Metals	Arsenic	Chromium VI	Mercury	Total Alkyl Lead	Phenolics (4AAP)	Volatiles, Halogenated	Volatiles, Non-Chlorinated	Volatiles, Water Soluble	Extractables, Base Neutral	Extractables, Acid (Phenolics)	Extractables, Phenoxy Acid Herbicides	Extractables, Organochlorine Pesticides	Extractables, Neutral-Chlorinated Dibenzo-p-dioxins and Dibenzofurans	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	Oil and Grease (Solvent Extractables)	Fatty and Resin Acids	PCBs
National Boring and Sounding Inc.	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	partial	partial	no	partial	no	no	yes	no	no	yes	no	yes
Noranda Inc., Env. Services	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Novalab Ltd.	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Nuclear Activation Service	no	no	no	no	no	no	no	no	partial	yes	no	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Nytest Environmental Inc.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	partial	partial	yes	yes	yes	yes	partial	partial	yes	yes	no	yes
OBG Laboratories, Inc.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	yes	yes	partial	partial	partial	no	yes	no	yes
Ontario Research Foundation	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Peninsula Chemical Analysis Ltd.	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	partial	yes	no	yes	no	no	no	yes	no	yes
Pluritec Ltee.	yes	yes	yes	yes	no	yes	yes	yes	partial	no	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	no	yes
Pollutech Limited	yes	no	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
Polysar Ltd.	yes	no	yes	no	yes	no	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	yes	no	no
Proctor & Redfern	yes	yes	yes	yes	yes	yes	yes	yes	partial	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
Proctor&Gamble Inc., Hamilton Plant	yes	yes	yes	yes	no	yes	yes	yes	partial	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Quatic Chemicals Limited	yes	yes	yes	partial	no	yes	yes	yes	partial	no	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	no	yes
Queen's University	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	yes	yes
R & P Laboratories Ltd.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
R.C. Harris Water Treatment Plant	yes	no	yes	partial	no	yes	yes	no	no	no	no	no	no	yes	partial	partial	no	no	no	no	no	no	no	no	no	no
R.L. Clark Water Treatment Plant	yes	no	yes	partial	no	yes	yes	no	partial	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	yes	yes	no
RMOC Pollution Control Centre	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	no	no
Reg. Mun. of Waterloo, Eng. Lab.	yes	yes	yes	yes	no	yes	yes	yes	partial	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	no	no
Region of Halton	yes	yes	yes	yes	yes	yes	yes	yes	partial	yes	no	yes	no	yes	no	no	no	no	no	no	no	no	no	yes	yes	yes
Research & Productivity Council	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	partial	partial	no	partial	yes	yes	yes	partial	no	yes	no	yes
Retek Resource Recovery	yes	yes	yes	partial	no	yes	yes	yes	partial	no	yes	no	no	yes	no	no	no	no	partial	no	partial	no	no	yes	no	yes
Sanexen International Inc.	yes	yes	yes	yes	no	yes	yes	sub	yes	yes	yes	yes	no	no	partial	partial	partial	partial	partial	no	no	no	no	yes	yes	yes
Saskatchewan Research Council	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	partial	partial	no	no	partial	yes	yes	no	no	no	yes	yes
Seetech Investigation Services	no	yes	yes	partial	yes	yes	yes	yes	no	no	no	no	no	no	partial	partial	no	partial	partial	partial	no	no	no	no	no	no
Shrader Analytical & Consulting Lab	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	no	partial	partial	no	no	no	no
Stegor Consultants Ltd	no	yes	yes	no	no	no	yes	yes	no	no	no	no	no	no	no	no	no	partial	no	no	no	no	no	no	no	yes
Syracuse Research Corporation	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Technical Service Laboratories	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Technitrol Canada Ltee	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	partial	partial	yes	yes	partial	no	yes	yes	yes
Thermo Analytical Inc./ERG	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Thunder Bay Analytical Labs Inc.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Toronto Central Laboratory	yes	no	yes	partial	no	yes	yes	no	partial	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
Toronto Research Laboratories	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no	no	no	partial	no	no	no	no	no
Uniroyal Chemical Research Labs.	no	no	yes	partial	no	no	no	yes	yes	no	yes	yes	no	no	no	no	partial	no	no	no	no	no	no	no	no	no
Universite de Montreal, Recherche	no	no	no	no	no	no	no	no	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
V.F.G. Consultants Inc.	yes	yes	yes	yes	no	yes	yes	yes	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
Walker Brothers Industries	no	yes	yes	yes	no	yes	yes	yes	partial	yes	yes	yes	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
Warner Laboratories/Gould Energy	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Water Supply Division, Works Dept.	no	no	yes	partial	partial	no	yes	yes	partial	no	no	no	no	no	no	no	no	no	no	no	no	no	no	sub	sub	yes
Wellington Environmentel Consultant	yes	yes	yes	yes	yes	yes	yes	yes	sub	sub	sub	sub	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no
Whiteshell Nuclear Research Est.	no	no	yes	partial	no	yes	yes	yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes
Windsor Utilities Commission	yes	no	yes	partial	no	yes	yes	yes	partial	yes	yes	yes	no	no	no	no	no	no	no	no	yes	no	no	no	no	yes
Zenon Environmentel	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	partial	yes	yes	yes	yes	partial	yes	yes	yes	yes

Partial - the lab can analyze some of the 'MISA group' parameters and not others. A description of the specific parameters that the labs can and cannot analyze is given in the CHEMCAP data file.

No - the laboratory cannot analyze any of the parameters in the 'MISA group'.

Sub - subcontract with another laboratory to analyze for the indicated 'MISA group'.

The survey results indicate that Canadian and American laboratories are widely capable of analyzing water quality and metals parameters. Eighty-four of the laboratories surveyed are capable of analyzing metals. Similarly, 87 of the labs can analyze water quality parameters. Only five of the laboratories surveyed have no capability to analyze inorganics (water quality as well as metals parameters). These laboratories specialize in organic analysis and do no inorganic work.

Organics analysis capability is not as widespread. Of the labs that conduct organic analysis, 46 can analyze PCBs; and 42 can analyze one or more of the 'MISA group' organics. However, only 21 laboratories can analyze all organics including dioxins and dibenzofurans. Twenty-six labs can analyze all, except dioxins. Thirty-six of the laboratories surveyed have no capability to analyze organics.

Further insights on the lack of organic capability were gained during the on-site visits to the shortlisted labs. A number of the shortlisted labs, that expressed organic capability, have GCs for organic analysis. MISA requires that many of the organic parameters, such as base-neutral extractables, be analyzed by GC-MS for certain parts of the

Monitoring Programs. Further, a number of laboratories had recently acquired GC-MS's that were not yet in service, meaning that they do not yet have extensive MISA organic capability, but will have in the next six months to one year. Many of the laboratory managers visited, expressed a further problem with respect to good organics analysis - there is not a large pool of personnel available in Canada that are experienced in GC-MS analysis. This, therefore, limits their ability to expand in organic analysis.

Another area where analytical capability appears to be lacking is in the analysis of alkyl leads. Many of the laboratories surveyed have the equipment, gas chromatograph and atomic absorption, to analyze alkyl leads. Only 12 of the 86 surveyed labs, however, expressed ability in analyzing these compounds. This is primarily due to a lack of validated methods for analyzing alkyl leads, as well as a lack of demand for this type of analysis. Many of the laboratories also expressed that they were not aware of a validated method for analyzing 'fatty and resin acids'.

4.1.1 Methodology

As discussed above, a number of laboratories expressed that they were not aware of validated methodology for analysis of alkyl leads and fatty and resin acids.

The majority of laboratories surveyed were making great efforts to keep up-to-date with analytical methodology. There was some dichotomy, however, between small and large labs. Small labs relied on standard textbook methods which they modified as required. Some of the larger labs were more innovative in their methods development and had more formally

documented methods. All of the 35 labs, surveyed in detail, were using methodologies and instrumentation that met the general requirements of MISA. The labs were also making many efforts to improve the documentation of their methods. Much interest was expressed in receiving documented methods from respected agencies including the MOE.

4.2 Quality Assurance and Quality Control (QA/QC)

Quality assurance and quality control (QA/QC) procedures are an integral part of day to day laboratory operations as they help to ensure the validity of analytical results generated. QC activities (analysis of routine blanks and standards) are well in place at virtually all Canadian labs. The most recent advances in QA/QC are in the objective assessment of QC data and the rigorous documentation of QA/QC protocols. As such, both QC procedures and QA protocols have been evaluated in this study with particular emphasis being placed on the quality assurance activities and protocols at the 35 short-listed labs.

It must be noted that the QA/QC information reported in this survey is based on information received from the laboratories and confirmed by an on-site walkthrough of the 35 short-listed labs, conducted by the study team. No audit or detailed assessment of the various QA/QC management plans has been conducted. Further, the quality of analytical results from the labs has not been evaluated, through 'round-robins', etc. in this survey. The actual quality of labs will have to be determined over time both by prospective laboratory users and by government.

Therefore, this survey can make no statements about the actual quality of one laboratory compared to another. As such, laboratory users should take precautions to validate the quality of analytical results when selecting or using a lab. This can be done by conducting inter-laboratory checks of data and/or by having the laboratory analyze blind QC check samples.

QA/QC activities undertaken by labs fall into two distinct categories:

- analyzing control standards to ensure that analytical procedures are operating according to specification;

- evaluating and documenting QA/QC procedures and activities to ensure that 'analytical control' is assessed objectively.

All laboratories surveyed are analyzing sufficient numbers of control standards. As well, the majority of labs were taking part in 'round robins'. Many of the labs stated, however, that they were not aware of many 'round robins' and would be interested in taking part in as many as they could, if they are made aware. The labs were also very interested in having MOE sponsored 'round robins'.

Documentation of quality assurance procedures, analytical methods and evaluation of control standards (objectively) is either in place or under development in many Canadian laboratories. Many of the laboratories surveyed are small and have found it difficult to develop and implement rigorous QA/QC protocols. A number of labs also indicated, during the on-site visits, that until recently, there has been no requirement or incentive for rigorous QA/QC. Many of the lab managers stated that they were not aware of a comprehensive

approach in developing a rigorous QA/QC program and were actively seeking information or training on QA/QC. Surprisingly, very few of the labs saw no need for rigorous QA/QC and would put it in place only if required.

This is contrasted greatly with the American labs visited. The American labs surveyed have state-of-the-art QA/QC programs in place. These have been set up mainly because of requirements for QA/QC stipulated by the US EPA, specifically the Superfund Contract Lab Program, and many of the state governments.

4.3 Analytical Costs and Turnaround Times

A listing of the analysis cost ranges reported by the 94 laboratories that responded favourably to the survey, are shown in Table 6. The costs are presented in Canadian dollars. All U.S. dollar fees were converted to Canadian dollars using a factor of 1.3. Fee schedules for the individual surveyed labs are detailed in the CHEMCAP datafile. As can be seen, the costs given by the 86 labs are quite variable. Many of the laboratories indicated that they quoted very conservative costs due to the rigorous requirements of MISA. They also indicated that analysis costs are variable based on sample matrix and sample volume. Therefore the cost ranges shown in Table 6 should be used as an indication of order-of-magnitude only. The data base should be referred to for a better assessment of analytical costs. As well, industries should request actual costs for their analytical requirements, from the laboratories of interest prior to making any cost based decisions.

Similarly, turnaround times were reported by the labs. These times indicated how quickly the labs completed analysis both on a routine and emergency basis. There was a great variability in turnaround times reported. As well, many of the labs stated that times to complete analysis varied with their workload and other factors. Therefore, it is essential that industries ask prospective labs how quickly an analysis can be completed or request a completion date.

It is also imperative that laboratory users carefully weigh costs and turnaround times against the quality of analysis that can be provided by a lab.

4.4 Analytical Capacity

Analytical capacity, in the context of this study, is an assessment of the volume of analysis that the lab industry in Canada can handle. More specifically, it is an assessment of the volume of analysis that can be done by labs interested and capable of doing analysis under the MISA program. As with the capability information presented in Section 4.1, analytical capacity has been determined for:

- water quality;
- inorganic (metals);
- organic analysis.

Capacity information was requested from the 35 shortlisted labs under these three categories.

In the following sections the capacity of the 35 shortlisted labs is discussed, both present and with anticipated future expansion. This information is then used to estimate the analytical capacity of the 94 labs interested in MISA analysis. This 'extrapolated capacity' is then compared against the project demand for MISA. In this comparison, analytical capacity has been 'factored' to account for the fact that not all labs are currently 100% capable, either analytically or on a QA/QC basis, of meeting the requirements of MISA.

4.4.1 Analytical Capacity: Labs Visited

Table 7 details the analytical capacities of the 35 laboratories visited. The capacity figures shown are simple summations of all the capacity data obtained by direct questioning. The responses were elicited and discussed by three study team members (one from Dillon, two from the MOE) and were corrected for perceived under/over statements of capacity. The interview team was knowledgeable in lab instrumentation and staffing and were therefore able to critically evaluate the individual responses.

It should be noted that the capacity information given is, however, based on estimates.

Capacity figures (samples/week) were given, identifying stated existing capacity and expected capacity arising from expansion plans. The effect of regulatory initiatives like MISA is readily apparent. Capacity expansion plans in

TABLE 7

ACTUAL CAPACITY OF LABORATORIES VISITED DURING THIS STUDY

Location	CAPACITY, SAMPLES/WEEK IN PARAMETER GROUPING		
	Organics	Inorganics	Water Quality
Present Capacity:			
Ontario	590	6,700	2,100
Rest of Canada	800	1,600	1,200
British Columbia	120	250	250
Alberta	180	350	600
Saskatchewan	0	0	0
Manitoba	100	450	100
Nova Scotia	50	0	100
New Brunswick	100	50	0
Quebec	250	500	200
United States	10,900	10,600	3,300
Total	12,300	18,900	6,600
Expanded Capacity:			
Ontario	1,500	10,600	2,900
Rest of Canada	1,200	3,600	1,800
British Columbia	230	350	400
Alberta	230	1,350	700
Saskatchewan	0	0	0
Manitoba	100	850	200
Nova Scotia	50	0	100
New Brunswick	100	50	0
Quebec	500	1,000	400
United States	12,000	11,500	4,100
Total	14,700	25,700	8,800

Ontario and Canada reflect the increasing requirements for environmental analysis, particularly organics. This is primarily due to increased regulatory requirements for this type of analysis. Less expansion is anticipated in areas already better served, namely, water quality and to some extent inorganics. Modest growth plans in the U.S. reflect a more advanced regulatory program.

It is important to note that expansion trends have been confirmed. The information in Table 7 was collected in the summer of 1987; a second contact was made to all laboratories, expressing interest, at the end of 1987 to give labs an opportunity to correct the information on the data base. Corrected capacity data according to that later survey confirmed expansion plans expressed six months earlier. As well, many laboratories indicated that they had expanded staff and lab area during this six month period.

4.4.2 Analytical Capacity: Canadian Labs Expressing Interest

Employment statistics obtained from the labs were used to extrapolate from the verified capacity to the ultimate capacity. Laboratory employment figures have been summed for the labs visited and for all other labs expressing interest in MISA analysis. These are shown in Table 8. Employment statistics have also been separated for Ontario, the rest of Canada aggregated and for the individual provinces. At first it was thought that the known capacity could be extrapolated to the total by assuming that capacity was directly proportional to employee numbers.

TABLE 8

EMPLOYMENT STATISTICS FOR CANADIAN LABS

Location	LABS VISITED			LABS INTERESTED (INCLUDING THOSE VISITED)		
	Total	No. Providing Employment Stat.	No. Employees	Total	No. Providing Employment Stat.	No. Employees
Ontario	21	19	351	58	54	730
Rest of Canada	10	9	301	25	24	519
Alberta	2	2	90	5	5	137
British Columbia	2	2	143	3	3	149
Manitoba	2	2	42	3	3	49
New Brunswick	1	1	7	1	1	7
Nova Scotia	1	1	8	1	1	8
Quebec	2	1	11	11	10	150
Saskatchewan	0	0	0	1	1	19
Canadian Totals	**31**	**28**	**652**	**83**	**78**	**1,249**

This was not found to be the case for two reasons:

- It is believed that all the large labs where automation enhanced the productivity (samples/employee) were visited by the study team. Therefore, the actual reported capacity is probably higher than that of the remaining labs.

- Few labs offered a truly comprehensive service. Therefore as simple 'pro-rating' of capacity against employment statistics would overstate the likely true capacity of the labs that were not visited.

Thus it was decided to develop an "effective" employment statistic to take these two factors into account. This data is developed in Table 9 where it is shown how the stated employment numbers were decreased, for those labs that were not visited, to produce an "effective" total employment. Note that low, middle and high estimates for 'effective' employment were developed so that a range of extrapolated capacities would be available. Also note that a lower effective capacity was assumed for organic analysis compared with the others.

The ratio of effective employees to "verified" employees (in labs visited) was then used to develop the ultimate capacity, Table 10. The ratio was applied to the verified capacity as identified in Table 7. Total Capacity has been identified, in Table 10, for all three parameter groups identifying present and potential future capacity.

TABLE 9

EFFECTIVE NUMBER OF LAB PERSONNEL

Location	Stated Total	Organics			Inorganics and Water Quality		
		Low	Medium	High	Low	Medium	High
Ontario	730	430	540	650	580	654	730
Rest of Canada	519	345	410	475	430	475	519

L = Low range estimate = 20% (total-visited) + visited for organics.
= 60% (total-visited) + visited for others.

M = Mid-range estimate = 50% (total-visited) + visited for organics.
= 80% (total-visited) + visited for others.

H = High range estimate = 80% (total-visited) + visited for organics.
100% (total-visited) + visited = total for others.

TABLE 10

ULTIMATE CAPACITY OF LABS INTERESTED IN MISA WORK

SAMPLES/WEEK BY PARAMETER GROUP

		Organics	Inorganics	Water Quality
Present:				
Ontario	L	720	11,100	3,500
	M	910	12,400	3,900
	H	1,090	13,900	4,400
Rest of Canada	L	920	2,300	1,710
	M	1,090	2,500	1,900
	H	1,260	2,800	2,100
Total	**L**	**1,600**	**13,400**	**5,200**
	M	**2,000**	**14,900**	**5,800**
	H	**2,400**	**16,700**	**6,500**
Proposed:				
Ontario	L	1,800	17,500	4,800
	M	2,400	19,700	5,400
	H	2,800	22,000	6,000
Rest of Canada	L	1,400	5,100	2,600
	M	1,600	5,700	2,800
	H	1,900	6,200	3,100
Total	**L**	**3,200**	**22,600**	**7,400**
	M	**4,000**	**23,400**	**8,200**
	H	**4,700**	**28,200**	**9,100**

The low, middle and high range of effective employee estimates (Table 9) was also included to provide a range of capacities. The full geographic breakdown of the data has not been included as the individual provincial totals were not important in the use of this data.

The United States capacities have not been extrapolated on the same basis because no information on total employment in their sector was made available to the survey. The capacities of just four large U.S. labs already exceeds projected Canadian capacity for organics and matches capacity in the other two areas. It was estimated that the American labs visited had a total annual revenue of $25-$30 million, approximately 10% of the total U.S. revenue among environmental service labs (2). Total U.S. capacities are therefore, an order-of-magnitude greater than those given in Table 7.

4.4.3 Demand for Analytical Services

The MISA program is currently, and will in the future, require a large component of industrial effluent monitoring. Under the current scope of MISA, industrial effluents from 200 industries and as many as 400 municipal water pollution control plants will have to be monitored. In future, industries that discharge effluents to municipal sewage treatment plants may have to be monitored, as well. The precise number of industries in this category (indirect dischargers) is unclear at this time but estimates in the 6000 - 10,000 range have been made.

The types of monitoring that are and will be going on are as follows.

Pre-regulation monitoring, a cooperative industry-government monitoring program to identify target parameters for a regulated monitoring program. This program is underway in many sectors, particularly the direct dischargers.

Regulated monitoring, a mandated year-long monitoring program to quantify the character and temporal distribution of pollutant discharges. Parameters are selected from the EMPPL (Environmental Priority Pollutant List), a parameter listing that includes over 180 parameters. At present, the Petroleum Refining Sector Regulation is the only published regulation (awaiting promulgation).

Amended Regulatory Monitoring, a long-term monitoring program based on the results of the year-one monitoring. The monitoring regulation will be amended to reflect the results of the intensive first year monitoring; the frequency and target parameters would be fewer in number.

The demand for analysis will be the summation of the needs of all the industrial (direct and indirect) and municipal sectors over the three types of monitoring programs. It would not be a difficult summation if the schedule was known for each monitoring program, for each sector and for which list of parameters. These facts are not fixed so that a demand figure had to be developed on the basis of gross assumptions. These were provided to this study by the MOE and are outlined in Table 11.

It was assumed that the demand arising from the municipal sector would account for half the total demand. To determine the demand in the municipal sector, the analysis frequency and parameter type was assumed to be the same as that listed

TABLE 11
ANALYSIS DEMAND
(SAMPLES/WEEK)

SAMPLING FREQUENCY[1]	PARAMATER[1]	PARAMETER GROUP	TOTAL SAMPLES[2]	SAMPLES PER WEEK		
				WATER QUALITY	INORGANICS	ORGANICS
DAILY	pH, TSS, phenolics	Water Quality	146,000[2]	On-site	N.A.	N.A.
THREE TIMES PER WEEK	Nitrogen(1), TOC Phosphorus, VSS, Sulphide	Water Quality	62,400	1,200	N.A.	N.A.
	MISA 17, Oil and Grease, PCBs	Organics	62,400	N.A.	N.A.	1,200
THREE DAYS ONCE A QUARTER	COD, CN, Nitrogen(3) DOC, Conductivity	Water Quality	4,800	96	N.A.	N.A.
	Metals, Sb, As, Se	Inorganics	62,400	N.A.	1,200	N.A.
	MISA 16, 19/20	Organics	4,800	N.A.	N.A.	96
ANNUALLY	Hg	Inorganics	400	N.A.	8	N.A.
	MISA 18, Neut. Chlor. Dioxins, Vol. Extbles.	Organics	400	N.A.	N.A.	8
		MUNICIPAL SECTOR WEEKLY TOTALS		1,300	1,200	1,300
		TOTAL DEMAND[3]		2,600	2,400	2,600

1. Frequency and parameter list from Petroleum Refining Sector Regulation.

2. Sample total derived from applying Petroleum Refining frequency to 400 municipal system outfalls: e.g. 146000 = 400 outfalls x 365 days

3. Total demand assumes Municipal sector demand = 50% of total demand.

in the Petroleum Refining Sector Regulation. These assumptions have been used in developing sample demand for the parameter groupings (water quality, inorganic, organic) that were used in this lab capacity survey. Since the lab capacity data was obtained as weekly data, the demand data was averaged down to a weekly demand number.

This estimate does not address the timing of regulations. If the implementation time frame for MISA is protracted, the weekly demand will be lower. The demand is also averaged down to a one week period. This does not account for the actual demand for laboratory services which will result from the regulations. The actual demand is expected to be more sporadic with large demand at certain times and very little at others. This is a problem the Ministry should consider in developing a coordinated implementation program. The estimate also assumes only 800 effluent discharge points; if the indirect dischargers are all required to monitor, this number is an order-of-magnitude low. However, it may be argued that indirect dischargers may not be required to monitor as comprehensively so that on balance, the demand number may cover those programs.

4.4.4 Capacity Versus Demand

The demand for analysis in Table 11 can be compared with the available capacity in Table 10 to demonstrate that overall adequate capacity is available for the demand.

For inorganics and water quality parameters, the capacity is apparently able to meet the demand with existing capacity in Ontario alone and under the least optimistic assumptions used in developing the ultimate analytical sector capacity.

For the organic parameters the present capacity could fail to meet the demand in Ontario. Present capacity in Ontario plus the rest of Canada is not sufficient to meet the demand. However, proposed capacity will meet the demand if all labs in Canada are utilized. If only Ontario labs are considered, the future capacity will meet the demand under the most optimistic scenario but more likely will fall short.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The Inventory and Critical Review of Laboratory Resources had some pronounced findings from which the following conclusions can be made.

- Over 400 laboratories in Canada and the northeastern U.S. were identified as having a potential capability for chemical analysis.

- Approximately 50% (215) of these labs responded to this survey. A number of laboratory types indicated no interest in conducting MISA analysis for industry: These are:

  - o industrial labs
  - o government labs
  - o university labs

- Ninety-four (44%) laboratories reported interest in conducting MISA analysis.

  - o the majority of the interested laboratories were commercial labs (35) and consultants (18). This is to be expected as these types of organizations are already servicing industry in other regards;

  - o labs from all over Canada and those selected from the U.S. reported interest in doing MISA analysis. A number reported that they did not feel that Ontario industries would use their services because of the large distances. Others reported that they felt distance from Ontario caused no hindrance to their services due to proximity to air transport.

- Capability to analyze all of the MISA chemical parameters was reported.

  - o the majority of labs can analyze the water quality (87 of 94) and inorganic (84) parameters required under the MISA Monitoring Program;

  - o approximately half of the laboratories reported some organic analysis capability. Many of these labs analyze PCBs and/or organochlorine pesticides only. Thirty of the labs reported capability to analyze a 'broad range' of organic contaminants;

  - o very few of the labs can analyze dioxins, alkyl leads and fatty and resin acids. They also reported a lack of validated methodology for analyzing alkyl leads and fatty and resin acids;

  - o many laboratories reported a shortage of experienced analytical personnel, particularly in organics analysis, and a lack of current, well documented analytical methodology.

- All laboratories are routinely analyzing in-house QA/QC samples to ensure the quality of their analytical results.

- Many are in the process of developing QA/QC programs but there is a need for better education and incentives in this area.

- The majority of labs surveyed in Canada do not yet have rigorous documented QA/QC protocols in place.

- The American labs visited are very experienced in QA/QC and have rigorous programs in place. This is mainly due to legislative requirements.

- Most importantly, based on reported information and given the stipulation that MISA analysis may replace much of existing industrial effluent environmental analysis; current and future analytical capacity should meet the demands of MISA. However, current organics capacity may be lacking. As well, not all labs surveyed are 100% capable of MISA analyses (particularly with regard to QA/QC). Therefore, actual MISA capacity may be less than reported.

5.2 Recommendations

The Inventory and Critical Review of Laboratory Resources has been invaluable in that it is providing a data base of laboratories that are capable of providing analytical services to industry. The survey has also shown however that there are some areas in which existing laboratory capabilities must be improved to meet the rigorous requirements of MISA. As such the following recommendations have been made.

- The Inventory and Critical Review should be updated on a regular basis to ensure that any new laboratories entering into chemical analysis are added to the data base and to ensure that any changes in capabilities at the laboratories are documented on the data base.

- Industries using survey or data base information should verify information with prospective labs prior to

contracting - particularly costing and turnaround times. As well, laboratory users should carefully assess the quality of labs as part of the selection procedure.

- The MOE and industry associations should ensure that individual laboratories are not overloaded with analysis at some times and receive none at other times. This should be done by scheduling monitoring to ensure that labs receive samples for analysis on a well planned basis.

- To better evaluate whether the capacity reported in this survey will meet the demands of MISA, it may be necessary to reassess MISA demands as discussed in Section 4.4.3.

- Efforts should be made to ensure that there is adequate experienced analytical personnel available, in Canada, (particularly for organics analysis) that will be able to provide analytical services with the level of quality required under MISA. This could be done through development of university courses or through efforts in conjunction with professional associations.

- Incentives and training programs should be set up to improve the level of QA/QC to meet the requirements of MISA.

- MOE should consider sponsoring a 'round robin' program for interested laboratories.

- The MOE should take efforts to ensure that an up-to-date library of analytical methods is maintained.

REFERENCES

1. Municipal-Industrial Strategy for Abatement (MISA), A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters, Ministry of the Environment, June 1986.

2. Pfund, N.E., "Environmental Service Laboratories - Report Shows Strong Growth Ahead", Environmental Science and Technology, Vol. 21, No. 10, 1987.

APPENDIX A
LABORATORIES CONTACTED

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
117639 Canada Limited	CS1	Ontario
A.J. Testing Laboratories, Inc.	CL1	N.Y.
ASL Analytical Svce. Lab. Ltd.	CL2	B.C.
Abbott Laboratories	CL3	Quebec
Acadia Consultants & Inspectors	CS3	N.B.
Acadia University	U1	N.S.
Accurassay Laboratories Ltd.	CL5	Ontario
Agat Laboratories Ltd.	CL6	Alberta
Agat Technologies Inc.	I5	Alberta
Agri Service Lab Inc.	CL7	Ontario
Agri-Food Laboratories	CL160	Ontario
Agriculture Canada - Lab Services	G1	Ontario
Alberta Environmental Centre	G2	Alberta
Alberta Res Council,Coal Res.Centre	CR19	Alberta
Alcan International Ltd.	I6	Ontario
Alcan International Ltd.	I7	Quebec
Alcon Laboratories Ltd.	CL8	Ontario
Alpha Laboratory Services Ltd.	CL10	Alberta
American Standards Testing Bureau	CL11	N.Y.
Analytical and Biological Labs	CL13	MI
AquaRecherche Ltee	CS5	Quebec
Arctec Canada Limited	CL14	Ontario
Arctic Laboratories Ltd.	CL15	N.W.T.
Arthur D. Little of Canada Ltd.	CS6	Ontario
Asecor Ltd.	CS7	Ontario
Assayers Ontario Limited	I198	Ontario
Atlantic Analytical Services Ltd.	CL17	Newfoundland
Atlantic Coal Institute	CR20	N.S.
Atlantic Nuclear Services Ltd.	CL182	New Brunswick
Atlantic Testing Labs., Ltd.	CL18	N.Y.
Atlas Laboratories Co. Ltd.	CL19	Manitoba
Atlas Testing Labs and Services	CL20	Ontario
Atomic Energy of Canada Limited	CR2	Ontario
Austin Laboratories Ltd.	CL21	Michigan
Ayerst Research Laboratories	I193	Quebec
B.C. Environment	G3	B.C.
BASF Canada Inc.	I14	Quebec
BC Env&Parks (Aquatic Toxicity Lab)	G7	B.C.
Barringer Magenta Limited	CL23	Ontario
Battelle Columbus Labs	CL25	Ohio
Beacon Research Associates Ltd.	CS8	Ontario
Beak Analytical Services	CS79	Ontario
Bedford Institute	G14	N.S.
Bell-White Analytical Laboratories	CL27	Ontario
Bender Hygienic Laboratory	CL28	N.Y.
Bendix Avelex Inc.	I16	Quebec

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Binac Laboratories Inc.	CL29	Quebec
Bio Mega Inc.	CL30	Quebec
Bio-Chem Consulting Services Ltd.	CS9	Alberta
Bio-Research Laboratories Limited	CS10	Quebec
Bioanalytical Procedures Inc.	CS11	Michigan
Bionetics Analytical Labs	CL33	Virginia
Bioquest International Inc.	CS12	Manitoba
Biotechnical Developments Ltd.	I19	N.S.
Bondar-Clegg & Company Ltd.	CL183	Ontario
Borden Chemical Co. Canada Ltd.	I21	Ontario
Bristol Laboratories of Canada	I194	Quebec
British Columbia Hydro Research	CR3	B.C.
British Columbia Research	CR4	B.C.
Bruce A. Brown Assoc. Ltd.	CS13	Ontario
Buffalo Testing Laboratories, Inc.	CL35	N.Y.
C&M Engineering Ltd.	CS14	Alberta
C-I-L Inc. Chemicals Research Lab.	I24	Ontario
CCL Industries	I26	Quebec
CIL Explosives Technical Centre	I40	Quebec
CIL Paints Inc.	I27	Ontario
CIP Research Limited	I28	Ontario
CS Environmental Laboratory, Inc.	CS16	N.Y.
Caledon Laboratories Limited	I29	Ontario
Cambrian Engineering Group Ltd.	CS17	Ontario
Campro (Cambrian Processes Ltd.)	CS18	Ontario
Can Test Ltd.	CL37	B.C.
Can. Food Prod. Dev. Centre - MRC	CR8	Manitoba
Canac Consultants Ltd.	CS19	Quebec
Canada Cement LaFarge Limited	I33	Quebec
Canada Cement Lafarge	I34	Ontario
Canada Packers Limited	I35	Ontario
Canadair Limited	I37	Quebec
Canadian Centre for Inland Waters	G4	Ontario
Canadian General Electric	I38	Ontario
Canadian Industries Ltd.	I36	Quebec
Canadian Marconi Company	I41	Ontario
Canadian Pulp & Paper Assoc.	I42	Quebec
Canpro Laboratories	CL38	Ontario
Canton Analytical	CL39	Michigan
Canviro Analytical Laboratories Ltd	CS20	Ontario
Carleton University, Chemistry Dept	U3	Ontario
Central Testing Laboratory	CL40	Manitoba
Centre de Recherche en Sylvichimie	I45	Quebec
Centre de Recherches Minerales	I46	Quebec
Certified Testing Laboratories	CL181	N.Y.
Chem.& Metallurgy Labs(Blackstone)	CL50	N.Y.

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Chemex SEE CHEMEX - CALGARY	CL197	Ontario
Chemex Labs Alberta Inc.	CL46	Alberta
Chemex Labs Ltd.	CL43	B.C.
Chemex Labs. SEE CHEMEX - CALGARY	CL45	Alberta
Chemical & Geological Laboratories	CL47	Alberta
Chemical & Geological Labs Ltd.	CL48	Saskatchewan
Chemical & Geological Labs. Ltd.	CL49	Alberta
Chemlab Inc.	CL51	N.B.
Chemtech Consulting Group	CS52	N.Y.
Choisy Laboratories	CL52	Ontario
City Testing & Research Labs.	CL53	N.Y.
City of Winnipeg, Waterworks	ML24	Manitoba
Clayton Environmental Consultants	CS23	Ontario
Cogemat Inc.	I197	Quebec
CompuChem Laboratories Inc.	CL186	N.C.
Concord Scientific Corporation	CS24	Ontario
Concordia University	U4	Quebec
Conestoga-Rovers & Associates Ltd	CS25	Ontario
Connaught Research Institute	CR21	Ontario
Core Laboratories (Canada) Ltd.	CL58	Alberta
Core Laboratories Ltd.	CL60	Alberta
Core Laboratories-Canada Ltd.	CL61	N.S.
Corp. de L'Ecole Polytechnique	U5	Quebec
Dalhousie University	U6	N.S.
Dalhousie University	U7	N.S.
Davis Engineering Limited	CS26	Ontario
Dearborn Chemical Co. Ltd.	CS27	Ontario
Delcan Deleuw Cather Canada Limited	CS28	Ontario
Dell Tech Laboratories Limited	I57	Ontario
Diagnostic Research Laboratories	CL62	Ontario
Diagnostics Biochem Canada Inc.	CL63	Ontario
Diversified Research Laboratories	CL65	Ontario
Dobrocky Seatech (Atlantic) Ltd.	CL66	N.S.
Dobrocky Seatech Limited	CL67	B.C.
Domtar Inc., Research Centre	I59	Quebec
Dow Chemical Canada Inc.	I60	Ontario
DuPont Canada Inc, Research Centre	I62	Ontario
Dunlop Construction Prod. Inc.	I63	Ontario
Durham Public Works	ML5	Ontario
E.V.S. Consultants Limited	CS30	B.C.
EPA - Large Lakes Research Station	G6	Michigan
ERCO Industries Ltd.	I65	Ontario
ETC	I67	New Jersey
ETL Testing Laboratories, Inc.	CL68	N.Y.
Easterly Water Treatment Plant	ML20	Ontario
Eco Laboratories Incorporated (ELI)	CL195	Ontario

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Ecology & Environmental, Inc.	CS31	N.Y.
Eldorado Resources Ltd.	I69	Ontario
Energetec Engineering	CS32	Ontario
Engineering Department, City Hall	ML9	Ontario
Enviro-Test Laboratories	CL70	Alberta
Enviroclean	CL72	Ontario
Enviroclean	CL73	Ontario
Enviroclean	CL74	Ontario
Enviroclean, Windsor	CL76	Ontario
Envirocon Pacific Limited	CL75	B.C.
Enviromental Applications Group Ltd	CS33	Ontario
Environmental Centre	G8	Alberta
Environmental Resources Management	I74	N.Y.
Environmental Strategies, Inc	CS34	N.Y.
Esso Petroleum Canada - Research	I66	Ontario
Fairway Laboratories, Inc.	CL77	N.Y.
Farrington-Lockwood Co. Ltd.	CL184	Ontario
Fiberglass Canada Ltd.	I77	Ontario
Fitelson Laboratories, Inc.	CL78	N.Y.
Flett Research Ltd.	CS35	Manitoba
Forintek Canada Corp. Eastern Div	I200	Ontario
Fresh Water Institute	CR25	Manitoba
Galson Technical Services, Inc.	CL185	N.Y.
Galt Testing Laboratories Ltd.	CL79	Ontario
Gammarus Associates	CS36	Ontario
General Electric Analytical Lab.	CL80	N.Y.
General Foods Ltd.	I85	Ontario
General Testing Corp.	CL81	N.Y.
Geo Analytical Services Ltd.	CL82	Alberta
Geo-Limnos Consulting	CS37	Nova Scotia
Geochem Laboratories Limited	CL83	Alberta
Gore & Storrie Ltd.	CS38	Ontario
Grain Research Labs.	CR23	Manitoba
Guelph Chemical Laboratories Ltd.	CL86	Ontario
Guelph City Hall	ML13	Ontario
H.G. Engineering	CS40	Ontario
H.H. Angus & Associates	CS41	Ontario
Hamilton City Hall	ML4	Ontario
Hardy Associates (1978) Ltd.	CS42	Alberta
Hardy BBT Limited	I92	Alberta
Health & Welfare Cda - Env. Health	G9	Ontario
Heidelburg College	U9	Ohio
Hoechst Canada Inc.	I39	Quebec
Hudson Bay Mining & Smelting	I94	Manitoba
Hudson Bay Mining and Smelting	I95	Manitoba
Hydro Quebec - Inst. de Recherche	CR5	Quebec

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Hydro Research Services	CR24	Michigan
IMCO Laboratories, Inc.	CL87	N.Y.
INRS - Eau	CR6	Quebec
Inco Research & Development Center	I99	N.Y.
Ind.Tech.Centre, Manitoba Research	CR7	Manitoba
Independent Environmentalists	CS54	Alberta
Independent Measurement & Tech. Inc	CL88	Ontario
Independent Test-Lab Ltd.	CL89	Manitoba
Independent Testing Laboratories	CL90	Saskatchewan
Inficon Leybold-Heraeus	I101	N.Y.
Inspec Lab Inc.	CL95	Ontario
Inspec-Sol (Ontario) Ltd.	CL96	Ontario
Island Water Treatment Plant	ML22	Ontario
J.A. Smith & Associates Ltd.	CS47	Alberta
J.M. Schneider Ltd.	I104	Ontario
J.T. Donald Consultants	CS48	Ontario
JANS Laboratory	CL98	N.Y.
Jacques Whitford and Assoc. Ltd.	I106	N.S.
John Preston & Assoc./CBCL Ltd.	CS49	Nova Scotia
Johnston & Johnston Canada	I108	Quebec
KFL Instruments Inc.	I109	Ontario
King Technology	CS50	Ontario
Kingston Water Purification Plant	ML12	Ontario
Konstandt Laboratories, Inc.	CL99	N.Y.
LGL Ltd.	CS51	Ontario
Lab-Elite Ltd.	CL100	Quebec
Laboratoire Ecosag Ltee	CL102	Quebec
Laboratoire Pelagique Inc.	CL103	Quebec
Laboratoire d'Analyses Medicale	CL104	Quebec
Laboratoires Outaouais Inc.	CL105	Quebec
Labserco Ltd.	CL107	Ontario
Labstat Inc.	CL108	Ontario
Lajoie, Pellerin & Associes Ltee	CS43	Quebec
Lambton Scientific Inc.	CL109	Ontario
Les Lab. Alimen, Bio-Lalonde	CL110	Quebec
Les Laboratoires Gatineau	CL106	Quebec
Les Laboratoires Ville Marie Inc.	CL111	Quebec
Linde - Union Carbide	I111	Ontario
London City Hall	ML15	Ontario
Lozier/Camo Laboratories	CL112	N.Y.
Lucius Pitkin, Inc.	I116	N.Y.
Lynn & Johnston Labs Inc.	CL113	Quebec
M.F. Environmental Assoc.,Inc.	CS54	N.Y.
MKM Laboratories Ltd.	CL115	Ontario
MacMillan Bloedel Research	I118	B.C.
Malcolm Pirnie, Inc.	CS55	N.Y.

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Manitoba Environmental Services	G15	Manitoba
Manitoba Testing Laboratory	CL116	Manitoba
Mann Testing Laboratories	CL117	Ontario
Maritime Testing (1985) Ltd.	CL118	N.S.
McGill University - Ind. Research	U10	Quebec
McMaster University	U11	Ontario
Memorial University of Newfoundland	U12	Newfoundland
Merck Frosst Canada Inc.	I122	Quebec
Metro Products Inc.	I123	Michigan
Mich. Dept. of Health, Analytical	G10	Michigan
Microbe Incorporated	CL120	Ontario
Microbe One	CL180	Michigan
Miles Laboratories Ltd.	I195	Ontario
Ministere de l'Environment - Lab.	G11	Quebec
Molson Breweries - Tech. Centre	I124	Ontario
Monenco Analytical Laboratories	CL123	Alberta
Moniteq Ltd.	CL124	Ontario
Monsanto Canada Inc.	I125	Quebec
Morgan Schaffer Corporation	CL196	Quebec
Mosaic Chemical Corp.	I126	Ontario
NRC - Atlantic Research Lab.	G12	N.S.
National Biological Laboratory	CL126	Manitoba
National Boring and Sounding Inc.	CS53	Quebec
National Research Council-Chem.Div	G13	Ontario
National Testing & Research Lab.	CL128	Michigan
National Testing Laboratories Ltd.	CL129	Manitoba
New Brunswick Research Council	CR12	New Brunswick
Noranda Inc., Env. Services	I127	Quebec
Norwest Laboratories	CL133	Alberta
Nova Scotia Research Foundation	CR13	N.S.
Novalab Ltd.	CL134	Quebec
Nuclear Activation Service	CL187	Ontario
Nucro Technics	CL188	Ontario
Nytest Environmental Inc.	CL131	N.Y.
OBG Laboratories, Inc.	CS57	N.Y.
Oceanchem Ltd.	CS58	N.S.
Olin Water Services	CL135	N.Y.
Ontario Hydro, Research Division	CR14	Ontario
Ontario Paper Company Ltd.	I133	Ontario
Ontario Research Foundation	CR15	Ontario
P. Lane and Associates Ltd.	CS60	N.S.
PPM Canada Inc.	I135	Saskatchewan
Peninsula Chemical Analysis Ltd.	CL136	Ontario
Peterborough Filtration Plant	ML10	Ontario
Petroleum & Water Labs. Ltd.	CL137	Alberta
Photovac Incorporated	I136	Ontario

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Pittsburgh Testing Lab.	CL138	N.Y.
Pittsburgh Testing Laboratory	CL139	N.Y.
Pluritec Ltee.	CS61	Quebec
Pollutech Limited	CS62	Ontario
Polysar Ltd.	I139	Ontario
Polytechnic Laboratories Ltd.	CL140	Ontario
Polytechnical Laboratories	CL141	B.C.
Potash Corp. of Saskatchewan	I140	Sask.
Proctor & Redfern	CS63	Ontario
Proctor&Gamble Inc., Hamilton Plant	I141	Ontario
Professional Scientific Laboratory	CL142	N.Y.
Public Service Testing Labs.	CL144	N.Y.
Pulp & Paper Research Inst. of Can.	I143	Quebec
Quanta Trace Laboratories Inc.	CL145	British Columbia
Quatic Chemicals Limited	I144	Ontario
Queen's University	U13	Ontario
R & R Laboratories Ltd.	CL147	Ontario
R.C. Harris Water Treatment Plant	ML21	Ontario
R.L. Clark Water Treatment Plant	ML23	Ontario
RECRA Environmental Laboratory	CL148	N.Y.
RECRA Research, Inc.	CS64	N.Y.
RIA Consultants	CS65	Michigan
RMOC Pollution Control Centre	ML7	Ontario
Reg. Mun. of Waterloo, Eng. Lab.	ML6	Ontario
Region of Halton	ML3	Ontario
Regional Municipality of Niagara	ML2	Ontario
Reichhold Limited	I147	Ontario
Research & Productivity Council	CR16	New Brunswick
Research Foods Ltd.	I148	Ontario
Retek Resource Recovery	I199	Ontario
Richard Bland Associates	CL149	Ontario
Richard Young & Associates	CL150	Ontario
Roach Atlantic Ltd.	I149	N.B.
Ryan Analytical Services	CL151	Ontario
Saint Mary's University	U14	N.S.
Sandwell Technologies	I150	Ontario
Sanexen International Inc.	I152	Ontario
Sanexen International Inc.	I151	Quebec
Sarnia City Hall	ML18	Ontario
Saskatchewan Research Council	CR17	Saskatchewan
Sciex	I153	Ontario
Sea-Agri Tech Ltd.	I154	N.S.
Seakem Oceanography Ltd.	I156	N.S.
Seakem Oceanography Ltd.	I155	B.C.
Seatech Investigation Services	CS68	N.S.
Serdary Research Laboratories	CL153	Ontario

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Shell Canada - Research Centre	I158	Ontario
Shell Canada Limited	I159	Alberta
Sherritt Gordon Mines Ltd.	I160	Alberta
Shrader Analytical & Consulting Lab	CL154	Michigan
Shrader Analytical & Consulting Lab	CL155	Ontario
Shrader Analytical & Consulting Lab	CL156	Ontario
Soleco Consultants Inc.	CS69	Quebec
South Peel Water & Sewage System	ML11	Ontario
Spar Aerospace Ltd.	I162	Ontario
Spectrographic Testing Laboratory	CL158	Michigan
St. Francis Xavier University	U15	N.S.
Stablex Canada Inc.	I163	Que.
Stanley Engineering Group Inc.	CS70	Alberta
Steetley Industries Ltd.	I165	Ontario
Stegor Consultants Ltd.	CS71	Ontario
Stelco Research Centre (Stelco Inc)	I167	Ontario
Sudbury Municipal Laboratory	ML1	Ontario
Swanson Environmental Inc.	CS73	Michigan
Syntath	I170	Ontario
Syracuse Research Corporation	CL189	N.Y.
Systech Corp.	CL190	Ohio
TES Limited	I173	Ontario
Technical Expertise Inc.	I174	Ontario
Technical Service Laboratories	CL159	Ontario
Technical University of Nova Scotia	U16	N.S.
Technicon Canada Inc.	I175	Quebec
Technitrol Canada Ltee.	CL191	Quebec
Technitrol Expertise Inc.	CL192	Ontario
Technitrol Professional Services	CL193	Ontario
Testing Engineers & Consultants	I179	Michigan
The Aro Corp., Buffalo Division	I180	N.Y.
The DeHavilland Aircraft Co.	I181	Ontario
Thermo Analytical Inc./ERG	CL178	Michigan
Thunder Bay Analytical Labs Inc.	CL162	Ontario
Thurber Consultants - Alberta Ltd.	CS74	Alberta
Tioxide Canada Inc.	I183	Quebec
Toronto Central Laboratory	ML19	Ontario
Metro Toronto Industrial Waste Lab	ML17	Ontario
Toronto Main Treatment Laboratory	ML16	Ontario
Toronto Research Laboratories	CS75	Ontario
Tricil Limited	I184	Ontario
Triodem Technical Services Ltd.	CL164	Ontario
Trow Limited	CS76	Ontario
Uniroyal Chemical Research Labs.	I186	Ontario
Universite Laval	U18	Quebec
Universite de Montreal, Recherche	U19	Quebec

LABORATORIES CONTACTED

LABORATORY NAME	SECTOR CODE	LOCATION
Universite de Sherbrooke	U20	Quebec
University of Alberta	U21	Alberta
University of Alberta	U22	Alberta
University of British Columbia	U23	British Columbia
University of Calgary	U24	Alberta
University of Guelph	U25	Ontario
University of Manitoba	U26	Manitoba
University of Michigan, Great Lakes	U27	Michigan
University of New Brunswick	U28	N.B.
University of Regina	U29	Sask.
University of Saskatchewan	U30	Saskatchewan
University of Toronto	U31	Ontario
University of Victoria	U32	B.C.
University of Waterloo	U33	Ontario
University of Western Ontario	U34	Ontario
University of Windsor	U35	Ontario
University of Winnipeg	U36	Manitoba
V.F.G. Consultants Inc.	CS77	Quebec
Walker Laboratories	I196	Ontario
Warner Laboratories/Gould Energy	I81	PA
Warner Lambert Canada Ltd.	I189	Ontario
Warnock-Hersey Professional Service	CL194	Ontario
Wastewater Analysis Corp.	CL179	Michigan
Water Quality Management	CL166	Ontario
Water Supply Division, Works Dept.	ML8	Ontario
Water Testing Laboratory, Inc.	CL167	N.Y.
Waterloo Research Institute	U37	Ontario
Webb Laboratories	CL168	Ontario
Wehran Laboratories	CL169	N.Y.
Wellington Environmental Consultant	CL170	Ontario
Wescan Laboratories Ltd.	CL171	B.C.
Wescan Laboratories Ltd.	CL172	Manitoba
Western Research	CS78	Alberta
Western Research & Development	I192	Alberta
Whitehall Laboratories Ltd.	CL174	Ontario
Whiteshell Nuclear Research Est.	CR18	Manitoba
Windsor Utilities Commission	ML14	Ontario
Woodward Biomedical Diagnostic Serv	CL175	Michigan
Zenon Environmental	CL176	Ontario

APPENDIX B
MAIL OUT PACKAGE

DILLON
Consulting Engineers • Planners
Environmental Scientists

OUR FILE: 1400-01
YOUR FILE:

April 7, 1987

ATTENTION:

LABORATORY RESOURCES SURVEY

Dear Sirs:

We have been retained by the Ontario Ministry of the Environment to study laboratory resources in Ontario and neighbouring provinces and states. We are to assess laboratory capability for analytical services to industry which will be required under the Ontario Municipal-Industrial Strategy for Abatement (MISA) program. An introductory letter from the Ontario Ministry is included herewith.

Our survey will be conducted in two parts. Intially, we are surveying labs by mail. This will be followed up by an on-site survey of some of the labs by Dillon and representatives of our clients at the Ministry.

To assist us, please complete the screening questionnaire we have developed for this survey. A return envelope is included for mailing the questionnaire back to us. Please ensure that the accompanying tables are returned as well.

The detailed questionnaire is also included for information only at this time. We intend to use it as the basis of the on-site survey. It will provide you with some idea of the scope of the study. We will be in touch with the short-listed labs soon to arrange for the on-site survey.

Yours truly,

M.M. DILLON LIMITED

Leslie E. Johnston, Ph.D.
Project Manager

M M DILLON LIMITED – 47 SHEPPARD AVENUE EAST, TORONTO, ONTARIO • TELEPHONE (416) 229-4646
MAIL BOX 1850 STATION A, WILLOWDALE, ONTARIO, CANADA M2N 6H5 • TELEX 064-7540 • FAX (416) 229-4692

Ontario
Ministry of the Environment
Ministère de l'Environnement

Ministry of the Environment
Laboratory Services Branch
P.O. Box 213,
Rexdale, Ont.
M9W 5L1

March 20, 1987

TO WHOM IT MAY CONCERN:

LABORATORY CAPABILITY STUDY, IN SUPPORT OF:
MUNICIPAL - INDUSTRIAL STRATEGY FOR ABATEMENT

Dear Sirs:

The Ontario Ministry of Environment has embarked on a new abatement program entitled the Municipal Industrial Strategy for Abatement (MISA), the goal of which is the virtual elimination of the discharged toxic pollutants (inorganic and organic) to the environmnent in Ontario.

The approach of MISA is to require under formal regulation that all industrial and municipal direct dischargers report to the Ministry the amounts of pollutants present in their effluents. Discharge data will be tabled according to protocols developed by the Ministry in consultation with the representatives from industry and municipalities. The attached schedules will provide the highlights of this sampling and analysis programs.

The requirement that industrial and municipal organizations monitor their own effluent quality, will likely require the services offered by private, corporate, university or public laboratories such as your own.

The Ontario Ministry of Environment has retained the services of M.M. Dillon Ltd., Consulting Engineers and Planners, to determine the adequacy of laboratory resources to service the analytical requirements of MISA, and you are invited to participate in this study by completing the attached questionnaire.

The Ministry, through M.M. Dillon, will be soliciting information in two stages. First, general laboratory information will be gathered. Information will also be solicited regarding analytical capabilities as they

... 2/

relate specifically to the MISA program, including matters of capability, capacity, quality control, fee structure and sample handling. This is the type of information you would make available to any potential client enquiring of your laboratory's capability, and will be made available to industrial and municipal groups who may be looking for laboratory assistance in order to facilitate compliance with the MISA regulations.

In the second stage a study team including representatives of the Ministry of Environment, Environment Canada and M.M. Dillon will visit selected laboratories that respond to this questionnaire, to assess their stated capabilities in order to ensure the validity of responses, and thus provide an objective assessment of overall present and projected private laboratory capacity/capability.

It is not the intention of this study to initiate an approval or accreditation process on the part of the Ministry. It is strictly a survey of capacity/capability. The results of the study will be computerized to provide the Ministry and the industrial and municipal dischargers information as to the overall availability of laboratory services. The results of this survey will also serve as a comprehensive list of private labs that the Ministry may wish to engage in any future interlaboratory studies.

You are encouraged to participate in this survey in a timely fashion to assist the Ministry in assembling its comprehensive laboratory data base directed towards support of the MISA program. The study will also provide you with invaluable information useful in planning to meet the challenge of anticipated higher workloads in your industry.

Yours truly,

Gerard C. Ronan

G.C. Ronan, Director
Laboratory Services Branch

GCR:jd

ONTARIO MINISTRY OF THE ENVIRONMENT

INVENTORY AND CRITICAL REVIEW OF LABORATORY RESOURCES QUESTIONNAIRE

PREAMBLE:

This questionnaire will provide a data base for the inventory and review of laboratory capability that M.M.Dillon Limited will be completing for the Ministry of the Environment in Ontario. As outlined in the introductory letter from the Ministry, the information being sought will be both general and confidential. The general information will be made publically available; the confidential information will only be used to critically assess capability. Two rounds of questioning will be undertaken, one to gather general information basically through use of the attached 'Screening Questionnaire', the second to gather specific information using an on-site interview and the 'Detailed Questionnaire' which is appended for your information and review.

It may be worthwhile for you to review the more detailed and confidential questions on the 'Detailed Questionnaire' so that you will be able to understand the depth of the probing that we intend to carry out in our critical review. We ask that you provide answers to the general questions on the Screening Questionnaire' at this time. On the basis of the replies we will develop a short list of laboratories to contact for the detailed follow-up survey. Any confidential information you choose to provide at this time will be treated as confidential among you, M.M.Dillon and the Ministry.

The questionnaire is divided into nine sections. The topics to be covered in these sections are listed below together with caveats to be considered at the outset.

CONTACT INFORMATION: This is the basic information on where your lab is located and who to ask for. Please include your postal/zip code so we can sort the data on computer.

CAPABILITY: Your present capability is being requested. Please feel free to hypothesize about expansion but let us know what you do now and what you plan to do in the near future.

PHYSICAL FACILITIES: A generic description of space and equipment facilities. Information on redundancy or excess capacity that can be brought on stream quickly are important.

THROUGHPUT: Please differentiate between the throughput time required for the volume of work you handle routinely now and the time that may be required to process additional samples should requests for additional work materialize in the near future.

APPROACH TO QA/QC: Quality assurance/quality control will become an important part of analysis done under the MISA regulations. Please consider it as an absolute necessity in developing responses to capability and costs questions.

PERSONNEL: A general description of personnel employed in environmental or MISA related analysis. An indication of your ability or willingness to increase the numbers of your employees without other expansion will be useful.

COSTS: Most labs have price lists that are readily available to clients on request. Please consider volume discounts in an as generalized way as possible.

SAMPLING: We consider this to be an integral part of any comprehensive service and urge you to respond on how you ensure the integrity of a sample presented to you for analysis.

CLIENTELE: A general indication only is sought here so that we can assess in general terms which business sector you are most familiar with.

Please try to make a realistic assessment of your capabilities when completing this survey. It is important for the users of the information that will be made public from this survey to have a realistic view of what laboratories can and cannot do. At best, an overstated response will only open a few doors for you; at worst it may alienate an entire industry sector for long term repeat business. In addition, this survey is being conducted by professionally trained analysts and experienced users of analytical services in the waste management industry. This should facilitate the exchange and interpretation of information being supplied to the MOE and any possible industrial users of the public information being provided to this survey.

We are available to answer any questions on this questionnaire or general questions concerning the MISA initiative. Please do not hestitate to call Les Johnston or Catherine Williams in Toronto at (416) 229-4646. When you have completed the questionnaire please return it to us preferably by 27 April 1987 and by courier or facsimile copier (FAX) at (416) 229-4692.

SCREENING QUESTIONNAIRE

Please answer the questions below as completely as possible. Also, please complete the attached 'Table 1' identifying your capabilities to analyze specific chemical parameters. Schedule 1 and the 'Detailed Questionnaire' to this study are appended for your information only and to give you an idea of the scope of this laboratory assessment and the MISA program. PLEASE RETURN THE COMPLETED SCREENING QUESTIONNAIRE AND TABLE 1 TO US IN THE ENCLOSED RETURN ENVELOPE BY 27 APRIL 1987.

PART ONE: CONTACT INFORMATION

1. Laboratory Name:

2. Name of Parent Organization
   (If different from above):

3. Address:
   Street:

   P.O.Box:

   City: Province/State:

   Postal/Zip Code:

4. Contact:
   Name: Phone:

   Title:

   Alternate: Phone:

   Title:

5. Other Information:

PART TWO: CAPABILITY

1. Are you aware of the Ministry's MISA initiative? For reference, please refer to the Ministry's introductory letter and the lists of target chemical parameters and analytical methodologies included with this questionnaire.

2. Is your organization interested in doing analytical work under the MISA program? Are you prepared to provide information to this survey?

IF YOU ANSWERED NO TO QUESTIONS 1 & 2 DO NOT RESPOND TO THE REMAINING QUESTIONS BUT PLEASE RETURN IN THE STAMPED PRE-ADDRESSED ENVELOPE PROVIDED - THANK YOU FOR YOUR TIME.

3. Please complete the attached lists in Table 1 to identify briefly your capabilities to analyze specific chemical parameters. Please be realistic in assessing your current abilities to analyze these parameters. Consideration will be given to all laboratories regardless of whether you can analyze the entire list.

4. For the parameters you currently do analyze, how easily can you meet the the detection limits shown on the attached Schedule 1? Please indicate on Table 1 what detection limits you currently do attain. Are there any practical constraints like sample size that limit your ability to meet detectability requirements? If so, please describe.

5. How important is the sample substrate or matrix in limiting the capability of your analyses? What kinds of sample substrates or matrices are you capable of analyzing?

- clean waters,
- soils,
- industrial samples,
- environmental samples ,
- sludges,
- other? (please specify)

PHYSICAL FACILITIES

1. What is the physical size of your laboratory in area?

What portion (area) of your lab area is apportioned to:

	AREA (sq. ft.)
- organic analysis	
- inorganic analysis	
- sample preparation	
- wet chemistry	
- other (please specify)	

2. What portion of your facilities would be devoted to MISA type or environmental work at this time?

3. Describe how samples for analysis can be transported to your facilities.

NOTE: One possible approach to providing sufficient analytical capability for industry in Ontario is to have analysis performed at a location remote from the industry. In this situation the transmittal of samples in a timely fashion to the laboratory is crucial and will be the type of base information you should be able to provide to potential clients who may be accessing the data base that this survey will produce.

PART FOUR: THROUGHPUT

1. What has been the <u>average</u> turnaround time over the past year (reflecting normal workload) for each analysis or group of analyses that you have indicated capability for in Question 2.3 above? For simplicity, please answer this question on the attached Table 1 - chemical list pages as indicated.

2. What sort of emergency response throughput could you manage, again for each analysis or group of anlayses? Again, please repond on the attached 'Table 1' where indicated.

PART FIVE: APPROACH TO QUALITY ASSURANCE/QUALITY CONTROL

1. In the normal course of analysis do you analyze control standards, standard reference samples, duplicate unknown samples, blanks and/or spiked samples to ensure the quality of your data. If yes, what types of quality control samples do you routinely run?

2. Do you take part in interlaboratory round robin testing programs? If so which ones? Which parameters were analyzed in the round robin programs?

3. Is your lab accredited by any authorizing body(ies)? If so, by whom? For which parameters?

PART SIX: PERSONNEL

1. How many staff do you employ to perform the analyses described above? Please break down employee numbers by background, training and experience? Also, please provide a breakdown by the individual areas of expertise: inorganic, organic, sample preparartion etc?

PART SEVEN: FEE SCHEDULES

1. What fees do you charge for analyses? For simplicity, please answer this question on the attached Table 1 pages as indicated.

2. What volume discounts do you offer? Are there single sample premiums to be charged?

3. How do you charge for the cost of sampling materials (consumeables)?

4. Do you offer special package rates for groups of parameters such as the groups suggested in the MISA listings, or the EPA list of 126 priority pollutants?

PART EIGHT: SAMPLING

1. What assistance do you provide your clients in the acquisition of the appropriate samples. Do you provide advice only? Advice plus sampling materials? Materials only? Full service including the provision of manpower to carry out the sampling program? To what extent do you integrate the sampling and analytical teams?

2. Please provide instructions on the preferred mode of transport of samples to your lab. Who is the contact person? What packaging requirements are there for the various groups of MISA samples that might arrive at your facility? Is the mailling-address the same as the shipping address? Are there any special markings required for the samples that are to be forwarded to the lab?

PART NINE: CLIENTELE

1. Please describe the major users of your laboratory services? Please consider by business sector, eg:

- chemical industry,
- hospitals,
- food/feed industry,
- cosmetics,
- environmental studies,
- drug companies,
- forensic agencies
- other (please specify)

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
Chemical Oxygen Demand					
cyanide					
pH					
ammonia					
nitrate					
nitrite					
Total Kjeldahi Nitrogen					
Dissolved Organic Carbon					
Total Organic Carbon					
Total P					
conductivity					
Total Suspended Solids					
METALS					
aluminum					
cadmium					
chromium					
cobalt					
copper					
iron					
lead					
nickei					
silver					
vanadium					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
zinc					
arsenic					
chromium (VI)					
mercury					
TOTAL ALKYL LEAD					
diethyl lead(-inorg ligand)					
diethyldimethyl lead					
dimethyl lead(-inorg ligand)					
methyltriethyl lead					
tetraethyl lead					
tetramethyl lead					
triethyl lead(-inorg ligand)					
trimethyl lead(-inorg ligand)					
trimethylethyl lead					
PHENOLICS (4AAP)					
VOLATILES, HALOGENATED					
1,1,1-trichloroethane					
1,1,2,2-tetrachloroethane					
1,1,2-trichloroethane					
1,1-dichloroethane					
1,1-dichloroethylene					
1,2-dibromoethane					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILITY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
1,2-dichlorobenzene					
1,2-dichloroethane					
1,2-dichloropropane					
1,3-dichlorobenzene					
1,4-dichlorobenzene					
bromoform					
carbon tetrachloride					
chlorobenzene					
chloroform					
c-1,2-dichloroethylene					
c-1,3-dichloropropylene					
dibromochloromethane					
dibromomethane					
dichlorobromomethane					
ethyl chloride					
methyl bromide					
methyl chloride					
methylene chloride					
tetrachloroethylene					
t-1,2-dichloroethylene					
t-1,3-dichloropropylene					
trichloroethylene					
vinyl chloride					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
VOLATILES, NONCHLORINATED					
benzene					
butadiene					
cumene					
diethylbenzene					
ethyltoluene					
ethylbenzene					
propylbenzene					
styrene					
toluene					
trimethylbenzene(s)					
xylenes					
VOLATILES, WATER SOLUBLE					
acrolein					
acrylonitrile					
EXTRACTABLES, BASE NEUTRAL					
2,4-dinitrotoluene					
2,6-dinitrotoluene					
2-chloroethylvinylether					
4-bromophenylphenylether					
4-chlorophenylphenylether					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
acenaphthene					
acenaphthylene					
anthracene					
benz(a)anthracene					
benzo(a)pyrene					
benzo(b)fluoranthene					
benzo(ghi)perylene					
benzo(k)fluoranthene					
benzylbutylphthalate					
bis(2-chloroethoxy)methane					
bis(2-chloroisopropyl)ether					
bis(2-chloroethyl)ether					
bis-2-ethylhexylphthalate					
chrysene					
di-isobutylphthalate					
di-n-octylphthalate					
di-n-butylphthalate					
dibenz(a,h)anthracene					
diethylphthalate					
dimethylphthalate					
fluoranthene					
fluorene					
indeno(1,2,3-cd)pyrene					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
methylnaphthalene					
N-nitrosodiphenylamine					
naphthalene					
nitrobenzene					
phenanthrene					
pyrene					
EXTRACTABLES, ACID (phenolics)					
2,3,4,5-tetrachlorophenol					
2,3,4,6-tetrachlorophenol					
2,3-dichlorophenol					
2,4,6-trichlorophenol					
2,4-dimethyl phenol					
2,4-dinitrophenol					
2-nitrophenol					
4,6-dinitro-o-cresol					
4-chloro-m-cresol					
4-nitrophenol					
pentachlorophenol					
phenol					
EXTRACTABLES, PHENOXY ACID HERBICIDES					
2,4,5-T					
2,4-D					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
EXTRACTABLES, ORGANOCHLORINE PESTICIDES					
aldrin					
alpha-BHC					
beta-BHC					
gamma-BHC (lindane)					
alpha-chlordane					
gamma-chlordane					
heptachlor					
heptachlor epoxide					
methoxychlor					
o,p'-DDT					
p,p'-DDD					
p,p'-DDE					
p,p'-DDT					
EXTRACTABLES, NEUTRAL-CHLORINATED					
1,2,3,4-tetrachlorobenzene					
1,2,3,5-tetrachlorobenzene					
1,2,4-trichlorobenzene					
2,3,6-trichlorotoluene					
2,4,5-trichlorotoluene					
2,6,a-trichlorotoluene					
heptachlorostyrene					
hexachlorobenzene					

TABLE 1
CHEMICAL SPECIFIC ANALYTICAL CAPABILTY

PARAMETER	DO YOU ANALYZE	DETECTION LIMITS	AVERAGE TURNAROUND TIME (DAYS)	EMERGENCY TURNAROUND TIME (DAYS)	FEE ($)
hexachlorobutadiene					
hexachloroethane					
octachlorostyrene					
pentachlorobenzene					
CHLORINATED DIBENZO-p-DIOXINS & DIBENZOFURANS					
2,3,7,8-TCDD					
OCDD					
OCDF					
total heptaCDD					
total heptaCDF					
total hexaCDD					
total hexaCDF					
total pentaCDD					
total pentaCDF					
total TCDD					
total TCDF					
OIL & GREASE					
FATTY & RESIN ACIDS					
PCBs (Aroclors)					

SCHEDULE 1

Schedule

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
	ANALYTICAL TEST GROUPS CONVENTIONAL AND METAL GROUPS	TARGET PARAMETERS CONVENTIONAL AND METAL PARAMETERS	SAMPLE PREPARATION METHOD PRINCIPLES	INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	METHOD DETECTION LIMIT mg/L
1	Chemical Oxygen Demand (COD)	Chemical oxygen demand (COD)	Reflux (samples with solids) or Oven digestion at 150 C in presence of redox reagents	Back titration or Colourimetric measurement of Cr III	10
2	Cyanide	Cyanide	Acid distillation	Colourimetry or Titration if > 1mg/L	0.001
3	Hydrogen ion (pH)	Hydrogen ion (pH)	None	pH electrode and pH meter	N.A.
4	Nitrogen	Ammonia plus Ammonium	Distillation unless proven unnecessary	Colourimetry or Specific ion electrode or Titration	0.01 as N
4	Nitrogen	Nitrate	None	Colourimetry including step for reduction of NO3 to NO2 or Automated Technicon or Ion Chromatography	0.15 as N
4	Nitrogen	Nitrite	None	Colourimetric or Titration or Automated Technicon or Ion Chromatography	0.03 as N
4	Nitrogen	Total Kjeldahl nitrogen	Standard Kjeldahl digestion procedure unless proven unnecessary	Colourimetric	0.3 as N
5	Organic carbon (TOC, DOC)	Dissolved organic carbon (DOC) (analyze for DOC only if TOC < 5 mg/L)	Strip inorganic carbon	Automated UV digestion plus colourimetric measurement of CO2 or equivalent	0.5 as C
5	Organic carbon (TOC, DOC)	Total organic carbon (TOC)	Strip inorganic carbon	Beckman TOC analyzer or equivalent	5 as C

Schedule

6	Total phosphorus	Total phosphorus	Perchloric acid digestion unless proven unnecessary	Colourimetric	0.06 as P
7	Specific conductance	Specific conductance	None	Conductivity meter and cell	2 µS/cm
8	Total suspended solids (TSS)	Total suspended solids (TSS)	None	Gravimetric; pore size of filter<or=1 micron	2
9	Total metals	Aluminum	Nitric evaporation or aqua regia digestion	Atomic absorption spectrometry and Inductively Coupled Plasma (ICP)	0.03
9	Total metals	Cadmium			0.002
9	Total metals	Chromium			0.02
9	Total metals	Cobalt			0.02
9	Total metals	Copper			0.01
9	Total metals	Iron			0.02
9	Total metals	Lead			0.03
9	Total metals	Nickel			0.02
9	Total metals	Silver			
9	Total metals	Vanadium			0.03
9	Total metals	Zinc			0.01
10	Arsenic, Antimony	Arsenic	Acid Digestion	Hydride Generation Atomic Absorption	0.005
		Antimony			
11	Chromium (Hexavalent) (analyze for hexavalent Chromium only if total Chromium >.5mg/L)	Chromium (Hexavalent)	a) None b) Solvent extraction	a) Colourimetry b) Atomic absorption	0.01
12	Mercury	Mercury	Oxidative acid digestion	Cold vapour atomic absorption	0.0001
13	Total alkyl lead (analyze for Total alkyl lead if Total lead >.5mg/L)	Diethyl lead (-inorganic ligand)	a) Liquid/liquid extraction	a) Colourimetry using Dithizone reagent or Atomic absorption	0.0002
13	Total alkyl lead	Diethyldimethyl lead			0.0002
13	Total alkyl lead	Dimethyllead (-inorganic ligand)			0.0002
13	Total alkyl lead	Methyltriethyllead	b) Derivatization	b)Gas liquid chromatography Atomic absorption	0.0002
13	Total alkyl lead	Tetraethyl lead			0.0002
13	Total alkyl lead	Tetramethyl lead			0.0002
13	Total alkyl lead	Triethyl lead (-inorganic ligand)			0.0002
13	Total alkyl lead	Trimethyl lead (-inorganic ligand)			0.0002
13	Total alkyl lead	Trimethylethyllead			

Schedule

14	Phenolics (4AAP)	Phenolics (4AAP)	Distillation from acidified (pH<4) sample	Colourimetry (520nm) of buffered sample	0.001
15	Elemental Scan	Barium	None	Plasma(ICP) or	1
15	Elemental Scan	Beryllium		Direct Current Plasma (DCP)	1
15	Elemental Scan	Bismuth		Emission Spectroscopy	1
15	Elemental Scan	Boron			1
15	Elemental Scan	Calcium			1
15	Elemental Scan	Cerium			1
15	Elemental Scan	Dysprosium			1
15	Elemental Scan	Erbium			1
15	Elemental Scan	Europium			1
15	Elemental Scan	Gadolinium			1
15	Elemental Scan	Gallium			1
15	Elemental Scan	Germanium			1
15	Elemental Scan	Gold			1
15	Elemental Scan	Hafnium			1
15	Elemental Scan	Holmium			1
15	Elemental Scan	Indium			1
15	Elemental Scan	Iridium			1
15	Elemental Scan	Lanthanum			1
15	Elemental Scan	Lithium			1
15	Elemental Scan	Lutetium			1
15	Elemental Scan	Magnesium			1
15	Elemental Scan	Manganese			1
15	Elemental Scan	Molybdenum			1
15	Elemental Scan	Neodymium			1
15	Elemental Scan	Niobium			1
15	Elemental Scan	Osmium			1
15	Elemental Scan	Palladium			1
15	Elemental Scan	Platinum			1
15	Elemental Scan	Potassium			1
15	Elemental Scan	Praesodymium			1
15	Elemental Scan	Rhenium			1
15	Elemental Scan	Rhodium			1
15	Elemental Scan	Rubidium			1
15	Elemental Scan	Ruthenium			1
15	Elemental Scan	Samarium			1
15	Elemental Scan	Scandium			1
15	Elemental Scan	Selenium			1
15	Elemental Scan	Silicon			1
15	Elemental Scan	Strontium			1
15	Elemental Scan	Sulfur			1

Schedule

15	Elemental Scan	Tantalum			1
15	Elemental Scan	Tellurium			1
15	Elemental Scan	Terbium			1
15	Elemental Scan	Thallium			1
15	Elemental Scan	Thorium			1
15	Elemental Scan	Thulium			1
15	Elemental Scan	Tin			1
15	Elemental Scan	Titanium			1
15	Elemental Scan	Tungsten			1
15	Elemental Scan	Uranium			1
15	Elemental Scan	Yttrium			1
15	Elemental Scan	Zirconium			1
15	Elemental Scan	Rubidium	None	Atomic Emission or	1
15	Elemental Scan	Cesium		Direct Current Plasma (DCP)	1
				Emission Spectroscopy	
15	Elemental Scan	Fluorine	None	Neutron Activation Analysis or	1
15	Elemental Scan	Chlorine		Ion Chromatography or	1
15	Elemental Scan	Bromine		Specific Ion Electrode	1
15	Elemental Scan	Iodine			1

Schedule

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
	ANALYTICAL TEST GROUPS	TARGET PARAMETERS	SAMPLE PREPARATION	INSTRUMENTAL MEASUREMENT	ALTERNATE METHOD	METHOD
	ORGANIC GROUPS	ORGANIC PARAMETERS	METHOD PRINCIPLES	METHOD PRINCIPLES	PRINCIPLES	DETECTION
					AVAILABLE FOR	LIMIT
					ROUTINE	
					MONITORING ONLY	
					Y/N	ug/L
16	Volatiles, Halogenated	1,1,1-Trichloroethane	Purge and trap	Gas Chromatography/	Y	10
16		1,1,2,2-Tetrachloroethane		Mass Spectrometry (GC/MS)	Y	10
16		1,1,2-Trichloroethane			Y	10
16		1,1-Dichloroethane			Y	10
16		1,1-Dichloroethylene			Y	10
16		1,2-Dibromoethane (Ethylene dibromide)			Y	10
16		1,2-Dichlorobenzene			Y	10
16		1,2-Dichloroethane (Ethylene dichloride)			Y	10
16		1,2-Dichloropropane			Y	10
16		1,3-Dichlorobenzene			Y	10
16		1,4-Dichlorobenzene			Y	10
16		Bromoform			Y	10
16		Carbon tetrachloride			Y	10
16		Chlorobenzene			Y	10
16		Chloroform			Y	10
16		cis-1,2-Dichloroethylene			Y	ND*
16		Cis-1,3-Dichloropropylene			Y	10
16		Dibromochloromethane			Y	10
16		Dibromomethane (Methylene Bromide)			Y	ND
16		Dichlorobromomethane			Y	10
16		Ethyl chloride			Y	ND
16		Methyl bromide (Bromomethane)			Y	ND
16		Methyl chloride			Y	ND
16		Methylene chloride			Y	10
16		Tetrachloroethylene (Perchloroethylene)			Y	10
16		Trans-1,2-Dichloroethylene			Y	10
16		Trans-1,3-Dichloropropylene			Y	ND
16		Trichloroethylene			Y	10
16		Vinyl chloride (Chloroethylene)			Y	ND
17	Volatiles, Non-Chlorinated	Benzene	Purge and trap	Gas Chromatography/	Y	10
17		Butadiene		Mass Spectrometry (GC/MS)	Y	10
17		Cumene			Y	ND
17		Diethyl benzene			Y	10
17		Ethyl toluene			Y	10

Schedule

17		Ethylbenzene			Y	10
17		Propylbenzene			Y	10
17		Styrene			Y	ND
17		Toluene			Y	10
17		Trimethylbenzene(s)			Y	10
17		Xylenes			Y	10
18	Volatiles, Water Soluble	Acrolein	Purge and trap	Gas Chromatography/	Y	ND
18		Acrylonitrile		Mass Spectrometry (GC/MS)	Y	ND
18		3,3 Dichlorobenzidine			Y	ND
19	Extractables, Base Neutral	2,4-Dinitrotoluene	Liquid/liquid	Gas Chromatography/	N	10
19		2,6-Dinitrotoluene	extraction	Mass Spectrometry (GC/MS)	N	ND
19		2-Chloroethylvinylether			N	10
19		4-Bromophenyl phenyl ether			N	10
19		4-Chlorophenyl phenyl ether			N	10
19		Acenaphthene			Y	10
19		Acenaphthylene			Y	10
19		Anthracene			Y	10
19		Benz(a)anthracene			Y	10
19		Benzo(a)pyrene			Y	10
19		Benzo(b)fluoranthene			Y	10
19		Benzo(ghi)perylene			Y	10
19		Benzo(k)fluoranthene			Y	10
19		Benzyl butyl phthalate			N	10
19		Bis(2-chloroethoxy)methane			N	10
19		Bis(2-chloroisopropyl)ether			N	10
19		Bis(2-chloroethyl)ether			N	10
19		Bis-2-ethylhexyl phthalate			N	10
19		Chrysene			Y	10
19		Di-isobutyl phthalate			N	10
19		Di-n-butyl phthalate			N	10
19		Di-n-octyl phthalate			N	10
19		Dibenz(a,h)anthracene			Y	10
19		Diethyl phthalate			N	10
19		Dimethyl phthalate			N	10
19		Fluoranthene			Y	10
19		Fluorene			Y	10
19		Indeno(1,2,3-cd)pyrene			Y	10
19		Methyl naphthalene			Y	10
19		N-Nitrosodiphenylamine			N	10
19		Naphthalene			Y	10
19		Nitrobenzene			Y	10
19		Phenanthrene			Y	10

ANALYTICAL PRINCIPLES & MDL part b)

Schedule

19		Pyrene			Y	10
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol	Liquid/liquid	Gas Chromatography/	Y	10
20		2,3,4,6-Tetrachlorophenol	extraction	Mass Spectrometry (GC/MS)	Y	10
20		2,3-Dichlorophenol			Y	10
20		2,4,6-Trichlorophenol			Y	10
20		2,4-Dimethyl phenol			N	10
20		2,4-Dinitrophenol			N	10
20		2-Nitrophenol			N	10
20		4,6-Dinitro-o-cresol			N	10
20		4-Chloro-m-cresol			N	10
20		4-Nitrophenol			N	10
20		Pentachlorophenol			Y	10
20		Phenol			N	10
21	Extractables, Phenoxy Acid Herbicides	2,4,5-T	Liquid/liquid extraction	Gas Liquid Chromatography	N	1
21		2,4-D	pH adjusted to <2	Electron capture	N	0.5
			Derivatization	Dual capillary		
			Cleanup			
22	Extractables, Organochlorine Pesticides	Aldrin	Liquid/liquid extraction	Gas Liquid Chromatography	N	0.01
22		Benzene hexachloride, alpha	Neutral pH	Electron capture	N	0.01
22		Benzene hexachloride, beta	Cleanup	Dual capillary	N	0.01
22		Benzene hexachloride, gamma			N	0.01
22		Chlordane, alpha			N	0.02
22		Chlordane, gamma			N	0.02
22		Heptachlor			N	0.01
22		Heptachlor epoxide			N	0.02
22		Methoxychlor			N	0.1
22		o,p'-DDT			N	0.01
22		p,p'-DDD			N	0.01
22		p,p'-DDE			N	0.01
22		p,p'-DDT			N	0.01
23	Extractables, Neutral-Chlorinated	1,2,3,4-Tetrachlorobenzene	Liquid/liquid extraction	Gas Liquid Chromatography	N	0.01
23		1,2,3,5-Tetrachlorobenzene	Neutral pH	Electron capture	N	0.01
23		1,2,4-Trichlorobenzene	Cleanup if necessary	Dual capillary	N	0.01
23		2,3,6-Trichlorotoluene			N	0.01
23		2,4,5-Trichlorotoluene			N	0.01
23		2,6,a-Trichlorotoluene			N	0.01
23		Heptachlorostyrene			N	0.01
23		Hexachlorobenzene			N	0.01
23		Hexachlorobutadiene			N	0.01

Schedule

23		Hexachloroethane			N	0.01
23		Octachlorostyrene			N	0.01
23		Pentachlorobenzene			N	0.01
24	Chlorinated Dibenzo-p-dioxins and Dibenzofurans	2,3,7,8-Tetrachlorodibenzo-p-dioxin	Liquid/Liquid	Gas Chromatography/	N	0.0003
24		Octachlorodibenzo-p-dioxin	extraction	Mass Spectroscopy (GC/MS)	N	0.0003
24		Octachlorodibenzofuran	and cleanup		N	0.0003
24		Total heptachlorinated dibenzo-p-dioxins			N	0.0003
24		Total heptachlorinated dibenzofurans			N	0.0003
24		Total hexachlorinated dibenzo-p-dioxins			N	0.0003
24		Total hexachlorinated dibenzofurans			N	0.0003
24		Total pentachlorinated dibenzo-p-dioxins			N	0.0003
24		Total pentachlorinated dibenzofurans			N	0.0003
24		Total tetrachlorinated dibenzo-p-dioxins			N	0.0003
24		Total tetrachlorinated dibenzofurans			N	0.0003
25	Oil and grease (Solvent Extractables)	Oil and grease (Solvent Extractables)	Acidify with a mineral acid	Gravimetric	N	1000
			to approximately pH 2	Weigh to + or - 5%		
			Liquid/liquid extraction			
			Dichloromethane			
26	Fatty and Resin Acids	Fatty and Resin Acids	Liquid/liquid extraction	Gas Liquid Chromatography	N	
			pH adjusted to <2	Flame Ionization Detector		
			Derivatization	Dual capillary		
			Cleanup			
27	PCB'S	PCB's (10 aroclors present & total conc)	Liquid/liquid extraction	Gas Liquid Chromatography	N	0.10
			Neutral pH	Electron capture		
			Cleanup if necessary	Dual capillary		
	* ND: Not Determined					

DETAILED QUESTIONNAIRE

This detailed questionnaire is attached for your information only. It will be administered, by way of a personal site interview to a short list of laboratories as a Second Phase of this study. It will give you an idea of the level of detail that we will be seeking in this critical review.

PART ONE: CONTACT INFORMATION

1. Laboratory Name:

2. Name of Parent Organization if different than above:

3. Address: Street:
P.O.Box:
City: Province/State:
Postal/Zip Code:

4. Contact: Name: Phone:
Title:

Alternate: Phone:
Title:

5. Other Information:

PART TWO: CAPABILITY

1. Are you aware of the Ministry's MISA initiative? For reference, please refer to the Ministry's introductory letter and the lists of target chemical parameters and analytical methodologies included with this questionnaire. (Public)

2. Is your organization interested in doing analytical work under the MISA program? Are you prepared to provide information to this survey? (Public)

3. Do you perform all of the analyses listed at a suitable level of detectability? If not, do you have a partial capability? Which group of parameters are you prepared to undertake? (Public)

4. How do you handle requests for analyses that you do not do in your own facility? Do you work on an agency basis with other labs who will conduct the analysis for you at your request? Do you take responsibility for the analyses done by the other agency in this case? Which groups of parameters? How do you assure data integrity for any work carried out on an agency basis? (Confidential)

5. What analytical methodologies do you use? As stipulated by the Ministry (see attached list)? Equivalent methods? (Public) Are you prepared to document the methodologies for these equivalent methods? (Confidential)

6. Detail the types of methods used at your laboratory for each of the MISA chemical groups. Please use common shortform abbreviations such as MOE, EPA, SM, ICP, IC, AA, GC, GC/MS, HPLC, etc. (Confidential)

7. For the parameters you are prepared to analyze, how easily can you meet the requirements for detectability of all of the analytes? Are there any practical constraints like sample size that limit your ability to meet detectability requirements? (Public)

8. How important is the sample substrate or matrix in limiting the capability of your analyses? Please remember, these will be real industrial samples with possible multiple liquid and liquid/solid phases and where interferences may abound. What kinds of sample substrates or matrices are you capable of analyzing? (Public)

9. What is your approach to satisfying client deadlines in the event of equipment malfunction? Redundancy? Alternate methodology? Agency analysis? Other? (Confidential)

10. Is your organization contemplating any expansion of capability relative to any of the issues raised above? For example, have you considered expanding the size of your laboratory, or your technical staff? Have you considered purchasing more equipment of analytical instrumentation? Can you add additional parameters to your existing list to meet MISA analytical requirements? Please provide details in a general fashion and a contemplated timing? (Confidential)

11. Have you considered enhancing the utilization of your existing laboratory space and equipment by: adding additional work shifts; 'time-sharing' equipment with external organizations; sharing your existing space and equipment with other organizations during your off-shift periods; taking on contract analysis external to the normal business of your company (eg. Ontario Hydro contracting for external work). (Confidential)

12. Is there any market niche you occupy which is unique or do you offer analytical services provided by only a few labs (eg dioxins)? (Confidential)

PART THREE: PHYSICAL FACILITIES

1. What is the physical size of your laboratory (area)? Please break this area figure down into a size for inorganic and organic analytical instrumentation areas? What area of your facility is devoted to sample reduction to an analyzable fraction, eg wet chemistry, solvent extraction, sample clean-up etc.? (Public)

2. What portion of your facilities would be devoted to MISA type or environmental work at this time? Note: Questions are asked below on throughput and sample load so we are looking for a present dedication to this type of work with this question. (Public)

3. In a general way, list the types of equipment that you presently use to complete the various groups of analyses included in the MISA requirements. What redundancy of equipment do you have for additional work or maintenance of schedules in the event of equipment failure? (Confidential)

4. What facilities do you have for the storage of samples awaiting analysis? Similarly, what area is devoted to the provision of sampling services or supplies? (Confidential)

5. Describe how samples for analysis can be transported to your facilities. One possible approach to providing sufficient analytical capability for industry in Ontario is to have analysis performed at a location remote from the industry. In this situation the transmittal of samples in a timely fashion to the laboratory is crucial and will be the type of base information you should be able to provide to potential clients who may be accessing the data base that this survey will produce. (Public)

PART FOUR: THROUGHPUT

1. What is your nominal capacity to process samples in each of the MISA groups in which you are prepared to offer analyical services? (Confidential)

2. What fraction of that nominal capacity was devoted to the MISA-type or environmental analysis in the most recent time period for which you have adequate data? (Confidential)

3. What is the nominal turnaround time for each analysis or group of analyses on the MISA list (time from sample receipt to data delivery)? (Confidential)

4. What has been the <u>average</u> turnaround time in a recent time period for which you have information for each analysis or group of analyses reflecting your normal work load? (Public)

5. What sort of emergency response throughput could you manage, again for each analysis or group of anlayses? (Public)

6. Compare the nominal and average throughput and turnaround time with an optimal throughput and turnaround for your facility. This optimal turnaround should most likely assure quality data, reliable service to clients and general contentment of your staff. (Confidential)

7. How do you plan and schedule perishable samples through your laboratory? Do samples with a short shelf life disrupt the normal processing and if so how do you prioritize the work to get schedules back on track? (Confidential)

8. What capacity do you have to immediately increase your throughput and/or turnaround time? Please discuss in terms of adding additional staff, operating on a shift basis or sharing your facility with others if you do not use all your facilities 24 hours a day. (Confidential)

PART FIVE: APPROACH TO QUALITY ASSURANCE/QUALITY CONTROL

One definition of QA/QC is that quality assurance is a management function while quality control is a technical function connected to the day to day checking of an analytical function. In light of these general definitions please describe your approach to QA/QC.

1. In the normal course of analysis do you analyze control standards, duplicate unknown samples, blanks and/or spiked samples to ensure the quality of your data. If yes, what types of quality control samples do you run? (Public)

2. Do you take part in interlaboratory round robin testing programs? If so which ones? Which parameters were analyzed in the round robin program? (Public)

3. How do you evaluate your quality control sample data to ensure that your analytical system is in control and thus your unknown sample results are reliable? Do you:

- use your experience to tell you that duplicate or standard samples are "close enough"?
- plot a time chart of quality control samples?
- plot statistical control charts?
- other? (please specify) (Confidential)

4. Are there any laboratory accreditation programs in your jurisdiction? Has your lab taken part in any of these programs? If so, which ones? Have you been accreditted?

5. What management functions are in place in your lab to assure quality? To what extent are methods documented? How often are they up-dated? What directions are in place for staff so that they can perform quality control functions without fear of reprimand when a method goes out of control? What in house staff training or opportunities for outside up-grades are available to staff to improve their capabilities? (Confidential)

6. What are your chain of custody procedures? How do you assure your clients that the data produced belongs to the samples submitted? Have you ever produced data for legal purposes with all the attendant procedures? Briefly describe the procedures as you understand them that are required to produce a set of data that will stand up in court. (Confidential)

7. What provision do you make for the supply of distilled water for use as field and laboratory blanks? (Confidential)

PART SIX: PERSONNEL

1. How many staff do you employ to perform the analyses described above? Please break down employee numbers by background, training and experience? Also, please provide a breakdown by the individual areas of expertise: inorganic, organic, sample preparartion etc? (Public)

2. How is your work week organized? Shifts per week? Staff assigned to each shift? (Confidential)

3. What is the training and experience of your technically responsible staff? (Public)

4. What staff resources are available to you on short notice? For example are students or other parttime workers available to you or do you routinely use such staff to accommodate short term work loads? (Confidential)

5. How many vacancies are there in your present complement that could be filled without additional revenue needed to keep the new staff profitably employed? (Confidential)

6. How do you judge the availability of technical personnel in your geographic area? (Confidential)

7. What plans do you have to hire new staff in the immediate future? (Confidential)

PART SEVEN: FEE SCHEDULES

1. What fees do you charge for analyses broken down by category of analysis as per the MISA lists attached? (Public)

2. What volume discounts do you offer? Are there single sample premiums to be charged? (Public)

3. If you are planning to expand into a new area of analytical endeavour, can you provide a proposed schedule of fees? (Confidential)

4. How do you view the fee structure; are they cost driven or market driven? (Confidential)

5. Do you offer contract pricing where your services are based on a commitment to a sample volume? Is this work done on a retainer basis or based on a fee schedule? Are there break points where volume discounts start to apply? (Confidential)

6. How do you charge for the cost of sampling materials (consumeables)? (Public)

7. If your laboratory operates as part of a larger enterprise, are you able to identify directly attributable costs to the analytical work? Are you able to invoice and recover these costs from an outside agency? (Confidential)

8. Are there different charges for analyses undertaken under increasingly higher levels of quality assurance? For instance, do you have different charges if samples are analyzed for legal purposes, in triplicate, using multiple methods or confirmation by resorting to primary methods? (Confidential)

9. How do you account for the cost of QA/QC programs similar to those that will be mandated by the Monitoring Regulations under the MISA program? Are these costs included in your base charges or is there a premium charged? (Confidential)

10. Do you offer special package rates for groups of parameters such as the groups suggested in the MISA listings, or the EPA list of 126 priority pollutants? (Public)

PART EIGHT: SAMPLING

1. What assistance do you provide your clients in the acquisition of the appropriate samples? Do you provide advice only? Advice plus sampling materials? Materials only? Full service including the provision of manpower to carry out the sampling program? To what extent do you integrate the sampling and analytical teams? (Public)

2. What protocols do you follow or advise your clients to follow in the acquisition of samples? Ministry? Other? (Confidential)

3. Please provide instructions on the preferred mode of transport of samples to your lab. Who is the contact person? What packaging requirements are there for the various groups of MISA samples that might arrive at your facility? Is the mailling address the same as the shipping address? Are there any special markings required for the samples that are to be forwarded to the lab? (Public)

4. Who is responsible for the disposal of samples that have not been consumed in the analysis procedure? If samples are returned are there any special transmittal instructions? (Confidential)

PART NINE: CLIENTELE

1. Can you describe the major users of your laboratory services? Please consider by business sector, eg chemical industry, hospitals, food/feed industry, cosmetics, environmental studies, drug companies, forensic agencies. (Public)

2. Describe your organization's principal economic activity. (Confidential)

3. What fraction of your laboratory's work is dedicated to the provision of data for a regulatory or compliance purpose? (Confidential)

APPENDIX C
CAPABILITIES OF PARTICIPATING LABORATORIES

TABLE C-1

SHORT LIST OF LABS EXTENSIVELY CAPABLE
OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
ORF	CR15	Extensive - all except 3 BN, o,p-DDT, & PCDDs	Mississauga
Syracuse Res.	CL189	Extensive - all except alkyl leads & PCDDs	Syracuse, NY
New Brunswick Res. & Prod. Centre	CR16	Extensive - all except alkyl leads, 4 vol., 1 BN, & PCDDs	Fredricton
Tech. Services Labs.	CL159	Extensive - all except alkyl leads & PCDDs	Mississauga
Enviroclean	CL74	Extensive - all except alkyl leads & PCDDs	London
Guelph Chemical Labs.	CL86	Extensive - not doing some BN, pesticides, PCBs or PCDDs	Guelph
Nytest Env.	CL131	Extensive - all except alkyl leads & PCDDs	Westbury, NY
B.C. Research	CR4	Extensive - all except alkyl leads, 6 vol., 3 BN, 7 AE, & PCDDs	Vancouver
TMA/ERG	CL178	Extensive - all except alkyl leads	Ann Arbor, MI
Sask. Research	CR17	Extensive - all inorg. except alkyl leads, plus THMs, alkyl benzenes, AE, pesticides & PCBs	Saskatoon
Microbe	CL120	Extensive - all except cond., As, Hg, alkyl leads PCDDs	London
Compuchem	CL186	Extensive - all except alkyl leads	Raleigh, NC
Envirotest/ Northwest	CL70	Extensive - all except TOC, alkyl leads, 6 vol, 2 BN, PCDDs, fatty acids	Edmonton

TABLE C-1 (continued)

SHORT LIST OF LABS EXTENSIVELY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
Canpro	CL38	Extensive - all except haloethanes, 21 BN, PCDDs	Downsview
Barringer	CL23	Extensive - all except alkyl leads, PCDDs, fatty acids	Rexdale
Chemex	CL46	Extensive - can do inorg. except alkyl leads, vol. except benzenes, PAHs, AE, pesticides, PCBs	Calgary
ASL	CL2	Extensive - all except alkyl leads, 8 vol., PCDDs	Vancouver
ETC	I67	Extensive - all except DOC, alkyl leads	Edison NJ
Galson Tech.	CL185	Extensive - all except TKN, DOC, TOC, alkyl leads and PCDDs	Syracuse NY
Technitrol	CL191	Extensive - all except alkyl leads, chloro benzenes/toluenes, PCDDs	Downsview /Montreal
Peninsula	CL136	Extensive - all	Niagara Falls
Clayton Env.	CS23	Extensive - all except COD, TKN, DOC, TOC, octachlorostyrene	Windsor
Mann Testing	CL117	Extensive - all except alkyl leads, 2-chloro-ethylvinylether, hepta-chlorostyrene and fatty acids	Mississauga
Zenon Env.	CL176	Extensive - all except alkyl leads, 5 vol-NC, acrylonitrile, trichloro-toluenes, and heptachloro-styrene	Burlington

TABLE C-1 (continued)

SHORT LIST OF LABS EXTENSIVELY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
Alberta Res. - Coal Res. Lab	CR19	Extensive - all except TOC, cond., Hg, alkyl leads, pesticides/ herbicides, PCDDs, PCBs	Devon, Alta.
OBG Labs.	CS57	Extensive - all except alkyl leads, o,p'-DDT, chlorobenzenes/toluenes/ styrenes and fatty acids	Syracuse
Pollutech	CS62	Extensive - all except CN, Ag, V, As, Cr(VI), Hg, alkyl leads, dioxins	Oakville
Canviro/ Cantest	CS20	Extensive - all except alkyl leads, dioxins, fatty acids	Kitchener

TABLE C-2

SHORT LIST OF LABS MODERATELY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
B.C. Hydro	CR3	Wet chemistry and metals only	Surrey BC
Queen's U.	U13	Wet Chemistry and metals only	Kingston
Walker Bros.	I196	Wet chemistry and metals only	Thorald
Chem. & Geo. Labs.	CL47	Wet chemistry and metals only	Calgary
Toronto Research Labs.	CS75	Wet Chemistry and metals only	Toronto
Novalabs	CL134	Organics only - all	Lachine, PQ
Proctor & Redfern	CS63	Wet chemistry and metals only	Don Mills
Diagnostic Res. Labs./XRAL	CL62	Wet chemistry and metals only	Don Mills
Monenco	CL123	Wet chemistry and metals only - some organics coming onstream in 1987	Calgary
R & R Labs	CL147	Wet chemistry and metals only	Peterborough
Noranda	I127	Wet chemistry and metals only	Noranda PQ
Eldorado Res.	I69	Wet chemistry and metals only	Blind River
Thunder Bay Anal. Labs.	CL162	Wet chemistry and metals only	Thunder Bay
Whiteshell Nuclear Res.	CR18	Wet chemistry and metals - except TKN, DOC, TOC, Cr(VI), Hg, COD, CN	Pinawa, Man.

TABLE C-2 (continued)

SHORT LIST OF LABS MODERATELY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
Manitoba Res. Ind. Tech. Ctr	CR7	Metals except V, CN, pH, NH3, TSS	Winnipeg
Shrader Anal.	CL154	Organics only - except 2,4,5-T, 2,4-D, chlordanes, o,p-DDT, chlorinated BN, PCDDs, PCBs, and fatty acids	Detroit, MI
Wellington Environmental	CL170	Organics only - all except styrene; inorg. onstream end of 1987	Guelph
Seatech Invest.	CS168	CN, pH, NH3, NO3, TKN, DOC, TOC, P, TSS, cond., THMs, chloro-aliphatics, benzenes, PAHs, phenol, PCP, 2,4-D, DDTs, PCBs, fatty acids	Halifax
Bondar-Clegg	CL183	Inorganics except DOC, TOC, organochlorine pesticides, oil & grease, fatty acids and PCBs	Ottawa
EcoLabs	CL195	Organics only - all. CCIW employees use some CCIW resources	Rockwood
Agri Service	CL7	Inorganics only - all except DOC, TOC, V, Cr(VI)	Breslau
Forintek	I80	Inorganics only. Have equipment to do organics but not currently. Mainly do analysis for wood products industry.	Ottawa
Carleton U.	U3	Inorganics only - all	Ottawa
J.T. Donald	CS48	Inorganics only - all except DOC, TOC, Ag. Primarily analyze for APHA air quality.	Toronto

TABLE C-2 (continued)

SHORT LIST OF LABS MODERATELY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
AECL	CR2	Inorganics and organo-chlorine pesticides	Chalk River
Warner Labs	I81	Inorganics only - all except CN, DOC, TOC	Cresson, PA
CIL - Explosives	I40	Inorganics only - all except COD, CN, DOC, TSS, P, Ag, V, Cr(VI), Ag	McMasterville P.Q.
Dearborn	CS27	Inorganics only - all. Organics done for them by ASL	Mississauga
Quatic Chem.	I144	Inorganics only - all except TKN, DOC, TOC, Ag, V, As	Guelph

TABLE C-3

SHORT LIST OF LABS MARGINALLY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
Accurassay Labs.	CL5	Analysis done for them by Barringer Magenta	Kirkland Lake
U. de Montreal	U19	Metals only	Montreal
Western Research	CS78	Metals only	Calgary
Bio-Research Lab	CS10	pH, cond. - interested in expanding capability (have a GC)	Montreal
Uniroyal	I186	Metals except As, pH, NO3, TSS, benzenes, acrylonitrile, lindane	Guelph
Conestoga-Rovers	CS25	COD, pH, NH3, NO3, NO2, TKN, P, cond., TSS, Fe, phenolics, oil & grease	Waterloo
Nuclear Activ.	CL187	Metals only	Hamilton
VFG Consultants	CS77	COD, CN, pH, NH3, NO3, TKN, P, cond., TSS, phenolics, oil & grease Metals in near future.	Montreal
Canadian Food Product Dev. Centre	CR8	COD, pH, NH3, NO2, TKN, TSS, (pesticides, chloroBN, PCBs). Mainly a food research lab.	Portage la Prairie
Stegor Consult.	CS71	CN, pH, cond., TSS	Cambridge
Beacon Research	CS8	Inorganics except CN, DOC, TOC, cond., Al, Cd, Pb, V, As, Hg; do total phenolics but no other organics	Guelph
Agri-Food	CL160	Inorganics only - all except COD, CN, DOC, Cr, Co, V, As, Cr(VI). Primary analysis is agricultural for MAF.	Guelph

TABLE C-3 (continued)

SHORT LIST OF LABS MARGINALLY CAPABLE OF MISA TYPE ANALYSIS

NAME	SECTOR	ANALYTICAL CAPABILITY	LOCATION
Retek Resource	I199	Inorganics only - all except NH3, NO3, TKN, DOC, TOC, Al, Cd, Pb, Ag, V, As, Hg; do total phenolics. Plans to expand capability.	Brantford
Proctor & Gamble	I141	Wet chemistry except organ carbons and Al, Cu, Fe, Ni, Zn, As	Hamilton
Morgan Schaffer	CL196	PCBs only	Montreal
Dell Tech	I57	pH and TSS only	London

APPENDIX D
LABORATORIES NOT PARTICIPATING

TABLE D-1
COMMERCIAL LABS NOT PARTICIPATING

LABORATORY NAME	REASON GIVEN FOR NOT PARTICIPATING
Agat Laboratories Ltd.	No reason given
Arctec Canada Limited	No reason given
Atlas Testing Labs and Services	Unable to do MISA analysis
Austin Laboratories Ltd.	Laboratory sold
Bell-White Analytical Laboratories	No reason given
Bio Mega Inc.	Unable to do MISA analysis
Bionetics Analytical Labs	Conflicts with EPA obligations
Can Test Ltd.	See Canviro response
Chem.& Metallurgy Labs(Blackstone)	Meets internal needs only
Chemex SEE CHEMEX - CALGARY	See Chemex - Calgary
Chemex Labs. SEE CHEMEX - CALGARY	See Chemex - Calgary
Chemical & Geological Labs Ltd.	See Chem & Geo Labs in Calgary
ETL Testing Laboratories, Inc.	Unable to do MISA analysis
Enviroclean	See Enviroclean - London
Enviroclean, Windsor	See Enviroclean - London
Envirocon Pacific Limited	Unable to do MISA analysis
Fairway Laboratories, Inc.	Unable to do MISA analysis
Inspec Lab Inc.	No reason given
Laboratoires Outaouais Inc.	No reason given
Labserco Ltd.	Not an analytical laboratory
Lambton Scientific Inc.	No reason given
Les Laboratoires Gatineau	They do not do water analysis
Lynn & Johnston Labs Inc.	Drug testing lab. See Novalabs
Maritime Testing (1985) Ltd.	No reason given
Moniteq Ltd.	Airborne analysis only
Norwest Laboratories	Information under Enviro-test
Polytechnical Laboratories	No reason given
Richard Bland Associates	Unable to do MISA analysis
Shrader Analytical & Consulting Lab	See Shrader - Detroit
Technitrol Expertise Inc.	See Technitrol - Pointe Claire
Technitrol Professional Services	See Technitrol - Downsview
Warnock-Hersey Professional Service	Unable to do MISA analysis
Webb Laboratories	Company no longer in business
Whitehall Laboratories Ltd.	Not a commercial lab
Woodward Biomedical Diagnostic Serv	Diagnostic lab only

TABLE D-2
CONSULTANTS NOT PARTICIPATING

LABORATORY NAME	REASON GIVEN FOR NOT PARTICIPATING
Acadia Consultants & Inspectors	Unable to do MISA analysis
AquaRecherche Ltee	Bioassay lab, no interest
Bruce A. Brown Assoc. Ltd.	Materials laboratory only
Canac Consultants Ltd.	Internal analysis only for CN
Concord Scientific Corporation	Unable to do MISA analysis
Davis Engineering Limited	Unable to do MISA analysis
Delcan Deleuw Cather Canada Limited	No lab facilities
E.V.S. Consultants Limited	Unable to do MISA analysis
Geo-Limnos Consulting	No reason given
H.G. Engineering	Do not have lab facilities
H.H. Angus & Associates	Do no environmental analysis
J.A. Smith & Associates Ltd.	Geotechnical lab only
John Preston & Assoc./CBCL Ltd.	Do not perform lab analysis
LGL Ltd.	Not able to do analysis
P. Lane and Associates Ltd.	Does not apply to operations
Soleco Consultants Inc.	Do not provide lab services
Thurber Consultants - Alberta Ltd.	Unable to do MISA analysis
Western Research	MISA capability but no info

TABLE D-3
INDUSTRY LABS NOT PARTICIPATING

LABORATORY NAME	REASON GIVEN FOR NOT PARTICIPATING
Alcan International Ltd.	No reason given
Alcan International Ltd.	No reason given
Ayerst Research Laboratories	Meets internal needs only
Bendix Avelex Inc.	No facilities
Bristol Laboratories of Canada	Inhouse analysis only
CIL Paints Inc.	Unable to do MISA analysis
CIP Research Limited	No reason given
Canada Packers Limited	No reason given
Canadair Limited	no facilities
Centre de Recherches Minerales	Do not do MISA analysis
Domtar Inc., Research Centre	Internal analysis only
DuPont Canada Inc, Research Centre	No reason given
ERCO Industries Ltd.	Meets internal needs only
Esso Petroleum Canada - Research	No reason given
Fiberglass Canada Ltd.	No reason given
Hardy BBT Limited	Cannot meet MISA requirements
Hoechst Canada Inc.	Inhouse analysis only
Hudson Bay Mining and Smelting	Company unable to add workload
Inco Research & Development Center	Lab has been closed
J.M. Schneider Ltd.	Not equipped for MISA
Jacques Whitford and Assoc. Ltd.	Materials lab only.
Johnston & Johnston Canada	No longer doing environmental
Linde - Union Carbide	No laboratory facilities
MacMillan Bloedel Research	Not a public testing lab
Merck Frosst Canada Inc.	No reason given
Molson Breweries - Tech. Centre	No reason given
Monsanto Canada Inc.	Meets internal needs only
Photovac Incorporated	Unable to do MISA analysis
Potash Corp. of Saskatchewan	Unable to do MISA analysis
Pulp & Paper Research Inst. of Can.	No reason given
Sea-Agri Tech Ltd.	No lab available
Shell Canada - Research Centre	Meets internal needs only
Shell Canada Limited	Meets internal needs only
Spar Aerospace Ltd.	Unable to do MISA analysis
Stelco Research Centre (Stelco Inc)	No reason given
Technicon Canada Inc.	Do not perform analysis
Testing Engineers & Consultants	No reason given
The DeHavilland Aircraft Co.	Meet internal needs only
Tricil Limited	Not interested at present time
Warner Lambert Canada Ltd.	Unable to do MISA analysis

TABLE D-4
CROWN LABS NOT PARTICIPATING

LABORATORY NAME	REASON FOR NOT PARTICIPATING
Connaught Research Institute	QC lab only
Fresh Water Institute	Internal programs only
Grain Research Labs.	No reason given
INRS - Eau	No reason given

TABLE D-5
UNIVERSITY LABS NOT PARTICIPATING

LABORATORY NAME	REASON FOR NOT PARTICIPATING
Acadia University	Resources limited
Saint Mary's University	Does not do analytical service
Technical University of Nova Scotia	No reason given
Universite de Sherbrooke	Not interested
University of Alberta	No reason given
University of Guelph	Inhouse research programs only
University of New Brunswick	No reason given
University of Saskatchewan	No commercial capability
University of Waterloo	Labs for research and teaching
University of Western Ontario	Do not do commercial analysis
Waterloo Research Institute	Do internal analysis

TABLE D-6
GOVERNMENT LABS NOT PARTICIPATING

LABORATORY NAME	REASON FOR NOT PARTICIPATING
Agriculture Canada - Lab Services	Internal programs only
B.C. Environment	No reason given
BC Env&Parks (Aquatic Toxicity Lab)	Does not do analytical work
Bedford Institute	Lab not likely to do MISA work
Health & Welfare Cda - Env. Health	Internal programs only
Manitoba Environmental Services	Internal programs only
NRC - Atlantic Research Lab.	Do not do commercial analysis
National Research Council-Chem.Div	Internal programs only

TABLE D-7
MUNICIPAL LABS NOT PARTICIPATING

LABORATORY NAME	REASON FOR NOT PARTICIPATING
City of Winnipeg, Waterworks	Municipal laboratory only
Kingston Water Purification Plant	Not capable of MISA level work
Regional Municipality of Niagara	No reason given
Sarnia City Hall	Capacity for routine work only
Sudbury Municipal Laboratory	Performs plant analysis only

APPENDIX E
PARTICIPATING LABORATORIES

TABLE E-1
PARTICIPATING COMMERCIAL LABORATORIES

ASL Analytical Svce. Lab. Ltd.
1650 Pandora Street
Vancouver
B.C.
V5L 1L6
Contact #1: A.W. Maynard, Senior Partner @ 604-253-4188
Contact #2: John M. Park, Senior Partner @ 604-253-4188

Accurassay Laboratories Ltd.
P.O. Box 604, 3 Industrial Drive
Kirkland Lake
Ontario
P2N 3J5
Contact #1: Dr. George Duncan, President @ 705-567-6343
Contact #2: Mr. Larry Boisvert, Lab Manager @ 705-567-6343

Agri Service Lab Inc.
P.O. Box 1707 Station C, 353 Bridge St. E. Unit 2
Kitchener
Ontario
N2G 4R2
Contact #1: Bruce Neagle, VP & Lab Manager @ 519-742-5811
Contact #2: Ruth Oswald, Office Manager @ 519-742-5811

Agri-Food Laboratories
1-503 Imperial Road
Guelph
Ontario
N1H 6T9
Contact #1: Lee Battiston, Manager @ 519-837-1600
Contact #2: Wayne Brightwell, Supervisor @ 519-837-1600

Analytical and Biological Labs
29079 Ford Road
Garden City
MI
48135
Contact #1: Francis McLaughlin, Director @ 313-422-7474
Contact #2: Kim Klaft, Corporate Controller @ 313-422-7474

Barringer Magenta Limited
304 Carlingview Drive
Rexdale
Ontario
M9W 5G2
Contact #1: Alan Lipski @ 416-675-3870
Contact #2: John Ip @ 416-675-3870

TABLE E-1 (CONTINUED)

Bondar-Clegg & Company Ltd.
5420 Canotek Road
Ottawa
Ontario
K1J 8X5
Contact #1: William Wong, Manager @ 613-749-2220
Contact #2: Mike Ziebel, Chemist @ 613-749-2220

Canpro Laboratories
77 Champagne Drive
Downsview
Ontario

Contact #1: Dr. A. Gawhavy @ 416-635-8699
Contact #2: H. Tenenbaum @ 416-635-8699

Chemex Labs Alberta Inc.
2021 41 Ave. NE
Calgary
Alberta
T2E 6P2
Contact #1: Don Laberge @ 403-291-3077
Contact #2: Glen Nixon @ 403-291-3077

Chemical & Geological Laboratories
4605 12 St. NE
Calgary
Alberta
T2E 4R3
Contact #1: Dr. Ken Kow, Manager Lab Services @ 403-291-3024
Contact #2: Ron P. Price, General Manager @ 403-291-3024

CompuChem Laboratories Inc.
P.O. Box 12652, 3308 E.Chapel Hill, Nelson Hwy
Research Triangle Park
N.C.
27709
Contact #1: Ross Robeson @ 919-248-6407
Contact #2: John Kearns @ 919-248-6435

Diagnostic Research Laboratories
1885 Leslie Street
Don Mills
Ontario
M3B 3J4
Contact #1: John Novog, Technical Representative @ 416-445-5809
Contact #2: Karen Lopez, Lab Manager @ 416-445-5809

TABLE E-1 (CONTINUED)

Eco Laboratories Incorporated (ELI)
143 Dennis Street
Rockwood
Ontario
N0B 2K0
Contact #1: Dr B.G. Oliver, Vice President @ 519-856-9591

Enviro-Test Laboratories
9936 67 Ave.
Edmonton
Alberta
T6E 0P5
Contact #1: Dennis Erickson @ 403-434-9509
Contact #2: D.B. Birkholz @ 403-434-9509

Enviroclean
320 Adelaide Street South
London
Ontario
N5Z 3L2
Contact #1: Dr. R. Whitehead, Manager Lab Services @ 519-686-7558
Contact #2: W.M. Neaves, Senior Chemist @ 519-686-7558

Galson Technical Services, Inc.
6601 Kirkville Rd.
East Syracuse
N.Y.
13057
Contact #1: Eva Galson, Laboratory Director @ 315-432-0506
Contact #2: Diana Waldbillig, Client Services @ 315-432-0506

Galt Testing Laboratories Ltd.
P.O. Box 363, 15 High Ridge Court
Cambridge
Ontario
N1R 7L3
Contact #1: Erle Knill, Lab. Supervisor @ 519-621-8191
Contact #2: Tom Graham @ 519-621-8191

Guelph Chemical Laboratories Ltd.
246 Silvercreek Pkwy. N.
Guelph
Ontario
N1H 1E7
Contact #1: Dr. Raj N. Pandey @ 519-836-2313

TABLE E-1 (CONTINUED)

Mann Testing Laboratories
5550 McAdam Road
Mississauga
Ontario
L4Z 1P1
Contact #1: John Martin, President @ 416-890-2555
Contact #2: Tim Munshaw, Manager-Environmental @ 416-890-2555

Microbe Incorporated
85 Midpark Road
London
Ontario
N6N 1B2
Contact #1: Ms. Debbie Boersma, General Manager @ 519-668-1005
Contact #2: Dr. James Insell, President @ 519-668-1005

Monenco Analytical Laboratories
Bay 2, 2023 2nd Avenue S.E.
Calgary
Alberta
T2E 6K1
Contact #1: Dr. John Dean, General Manager @ 403-273-2525
Contact #2: Dr. Norman Chim, Assistant Manager @ 403-273-2525

Morgan Schaffer Corporation
5110 Courtrai Avenue
Montreal
Quebec
H3W 1A7
Contact #1: William Senchak @ 514-739-1967

Novalab Ltd.
9420 Cote de Liesse
Lachine
Quebec
H8T 1A1
Contact #1: J.D. Fenwick, Vice President @ 514-636-6218
Contact #2: M.G. Mastromatted Jr. @ 514-636-6218

Nuclear Activation Service
1280 Main St. W.
Hamilton
Ontario
L8S 4K1
Contact #1: Kathleen Blackwood, Manager @ 416-522-5666
Contact #2: Jim Sanders, Operations Sup. @ 416-522-5666

TABLE E-1 (CONTINUED)

Nytest Environmental Inc.
P.O. Box 1518, 60 Seaview Blvd
Pt. Washington
N.Y.
11050
Contact #1: John Gaspari @ 516-625-5500
Contact #2: Remo Gigante @ 516-625-5500

Peninsula Chemical Analysis Ltd.
P.O. Box 810, 8407 Stanley Avenue
Niagara Falls
Ontario
L2E 6V6
Contact #1: Dr. Richard J. Smythe, Director @ 416-356-7667
Contact #2: Dave Johnston, Chief Chemist @ 416-356-7667

R & R Laboratories Ltd.
1557 Fair Ave.
Peterborough
Ontario
K9K 1T1
Contact #1: Dr.Ramesh Makhija @ 705-748-9564

Shrader Analytical & Consulting Lab
3814 Vinewood
Detroit
Michigan
48208
Contact #1: Stephen Shrader, President @ 313-894-4440
Contact #2: Marianne L. Shrader, Controller @ 313-894-4440

Syracuse Research Corporation
Merrill Lane
Syracuse
N.Y.
13210-4080
Contact #1: Dr. Alison Carter, Lab Manager @ 315-425-5100
Contact #2: Mr. Craig Turner @ 315-425-5100

Technical Service Laboratories
1301 Fewster Dr.
Mississauga
Ontario
L4W 1A2
Contact #1: Walter Grondin @ 416-625-1544
Contact #2: Paul Burgener @ 416-625-1544

Technitrol Canada Ltee.
121 Boul. Hymus
Pointe-Claire
Quebec
H9R 1E6
Contact #1: Harry Baikowitz, President @ 514-697-3273

Thermo Analytical Inc./ERG
117 N. First Street
Ann Arbor
Michigan
48104
Contact #1: Martin Mathes, Dir. of Marketing @ 313-662-3104
Contact #2: Robyn Wooley, Sales Coordinator @ 313-662-3104

Thunder Bay Analytical Labs Inc.
1081 Barton Street
Thunder Bay
Ontario
P7B 5N3
Contact #1: A.D. Martinuzzi, President & Manager @ 807-623-6463
Contact #2: R. Matthews & M. Leung @ 807-632-6463

Wellington Environmental Consultant
389 Laird Road
Guelph
Ontario
N1H 6J3
Contact #1: Brock Chittim, Manager @ 519-822-2436
Contact #2: Judith M. Sparling, Lab Manager @ 519-822-2436

Zenon Environmental
854 Harrington Court
Burlington
Ontario
L7N 3P3
Contact #1: Dr. Glenys Foster, Manager, Analytical Serv. @ 416-639-6320
Contact #2: John Coburn, President @ 416-639-6320

TABLE E-2
PARTICIPATING CONSULTANTS

Beacon Research Associates Ltd.
336 Woolwich Street
Guelph
Ontario

Contact #1: John Edwards, President @ 519-821-5701
Contact #2: D. Hoshowsky, Technical Consultant @ 519-576-8475

Beak Analytical Services
6870 Goreway Drive
Mississauga
Ontario
L4V 1P1
Contact #1: John Robertson @ 416-671-2600
Contact #2: John Sliwinski @ 416-671-2600

Bio-Research Laboratories Limited
87 Senneville Road
Senneville
Quebec
H9X 3R3
Contact #1: R. Pike @ 514-457-2280
Contact #2: Pam Burnett @ 514-457-2280

CS Environmental Laboratory, Inc.
PO Box 0429, 5854 Butternut Drivet.
East Syracuse
N.Y.
13057
Contact #1: Patrick A. Leone, Jr., Vice President @ 315-446-8795
Contact #2: Conrad Teufel, Jr., Lab. Director @ 315-446-8795

Canviro Analytical Laboratories Ltd
178 Louisa Street
Kitchener
Ontario
N2H 5M5
Contact #1: Mr. Jeff Pike, Laboratory Manager @ 519-579-4230
Contact #2: Mr. Dale Sutherland, Chief Chemist @ 519-579-4230

Clayton Environmental Consultants
400 Huron Church Rd.
Windsor
Ontario
N9C 2J9
Contact #1: Shekar Viswanathan, Ph.D. @ 519-255-9797

TABLE E-2 (CONTINUED)

Conestoga-Rovers & Associates Ltd
651 Colby Drive
Waterloo
Ontario
N2V 1C2
Contact #1: Bruce Clegg, Project Coordinator @ 519-884-0510
Contact #2: Paul Plotz, Lab Supervisor @ 519-884-0510

Dearborn Chemical Co. Ltd.
P.O. Box 3060, Station A, 3451 Erindale Station Road
Mississauga
Ontario
L5A 3T5
Contact #1: Igor Marvan, Technical Director @ 416-279-2222
Contact #2: John Daly, Coordinator @ 416-279-2222

J.T. Donald Consultants
251 Bartley Drive
Toronto
Ontario
M4A 2N7
Contact #1: George Auld, Vice President @ 416-751-5230

National Boring and Sounding Inc.
1325 Newton
Boucherville
Quebec
J4B 5H2
Contact #1: Lise Remy, Chemist @ 514-655-9510
Contact #2: Alain Michaud, Admin. Director @ 514-655-9510

OBG Laboratories, Inc.
P.O. Box 4942, 1304 Buckley Rd.
Syracuse
N.Y.
13221
Contact #1: David Hill @ 315-457-1494
Contact #2: A.R. Martin @ 315-457-1494

Pluritec Ltee.
P.O. Box 1835, 2255 Boul. des Recollets
Trois Rivieres
Quebec
G9A 5M4
Contact #1: Paul Giguerre, Director @ 819-379-8010
Contact #2: Andre Cossette, Senior Technician @ 819-379-8010

TABLE E-2 (CONTINUED)

Pollutech Limited
768 Westgate Road
Oakville
Ontario
L6L 5N2
Contact #1: Dr. Jack Norman, President @ 416-844-1900
Contact #2: Mr. R. Laughton, Vice President @ 416-844-1900

Proctor & Redfern
45 Green Belt Dr.
Don Mills
Ontario
M3C 3K3
Contact #1: Dr. S. Wyse, Senior Chemist @ 416-445-3600
Contact #2: Mr. T. Branny, Environmental Chem. @ 416-445-3600

Seatech Investigation Services
P.O. Box 2161,Station 'M', 1127 Barrington St., Suite 17
Halifax
N.S.
B3J 3C4
Contact #1: C. MacGregor @ 902-423-5296
Contact #2: M. Fraser @ 902-423-5296

Stegor Consultants Ltd.
225 Sheldon Rd.
Cambridge
Ontario
N1T 1A1
Contact #1: Bill King @ 519-621-9743
Contact #2: Steve Mader @ 519-621-9743

Toronto Research Laboratories
250 Adelaide Street West
Toronto
Ontario
M5H 1X6
Contact #1: John Stevens, Tech. Director @ 416-977-3881

V.F.G. Consultants Inc.
Room 43, 3300 Cavendish Blvd.,
Montreal
Quebec
H4B 2M8
Contact #1: Maurice G. Vezina @ 514-482-3610
Contact #2: Rejean Beauchemin @ 514-482-3610

TABLE E-3
PARTICIPATING INDUSTRY LABORATORIES

Assayers Ontario Limited
33 Chauncy Ave
Toronto
Ontario
M8Z 2Z2
Contact #1: John van Engelen @ 416-239-3527
Contact #2: E.W. Warren @ 416-366-3100

CIL Explosives Technical Centre
801 Richelieu Blvd.
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Quebec
J3G 1T9
Contact #1: J.M.C. Ridden, Team Leader @ 514-467-3314

Dell Tech Laboratories Limited
809 Dundas St.
London
Ontario
N5W 5P6
Contact #1: Stephen Chambers, Lab Manager @ 519-679-7730
Contact #2: Robert Dell, President @ 519-679-7730

Dow Chemical Canada Inc.
P.O. Box 3030, R & D Labs
Sarnia
Ontario
N7T 7M1
Contact #1: Brian Worthington, Analytical Supervisor @ 339-3568
Contact #2: Al McDowell, Research Manager @ 339-3872

ETC
P.O. Box 7808, 284 Raritan Center Parkway
Edison
New Jersey
08818
Contact #1: Merna Hurd, P.E. @ 201-225-6700
Contact #2: Jeb Conner @ 201-225-6700

Eldorado Resources Ltd.
P.O. Box 1539, Highway 17 West
Blind River
Ontario
P0R 1B0
Contact #1: T.P. Smith @ 705-356-1496
Contact #2: D.J. Francis @ 705-356-1496

TABLE E-3 (CONTINUED)

Forintek Canada Corp. Eastern Div
800 Montreal Rd.
Ottawa
Ontario
K1G 3Z5
Contact #1: Jacques Carette @ 613-744-0963
Contact #2: Pierre Meloche @ 613-744-0963

Noranda Inc., Env. Services
P.O. Box 2415, 218 Murdoch Ave.
Rouyn-Noranda
Quebec
J9X 5A9
Contact #1: Michel Bedard @ 819-762-7764
Contact #2: Claude Boucher @ 819-762-2492

Polysar Ltd.
P.O. Box 3001, Vidal St. S.
Sarnia
Ontario
N7T 7M2
Contact #1: C.J. West @ 519-337-8251
Contact #2: T. Glaister @ 519-337-8251

Proctor&Gamble Inc., Hamilton Plant
P.O. Box 589, 1142 Burlington St. East
Hamilton
Ontario
L8N 3L5
Contact #1: D.W. Ireland, Laboratory Manager @ 416-545-1121
Contact #2: R.A. Bryan, Technical Services @ 416-545-1121

Quatic Chemicals Limited
P.O. Box 952, 61 Lewis Rd.
Guelph
Ontario
N1H 6M6
Contact #1: Barbara J. Beaverstone, Laboratory Manager @ 519-821-7780
Contact #2: A. Venerus, Vice President @ 519-821-7780

Retek Resource Recovery
PO Box 1584, 66 Mohawk Street
Brantford
Ontario
N3T 5V6
Contact #1: Dan Hoshowsky, Technical Manager @ 519-756-9770
Contact #2: Helen Graham @ 519-756-9770

TABLE E-3 (CONTINUED)

Sanexen International Inc.
2870 Industriel
Laval
Quebec
H7L 3S2
Contact #1: Richard Cormier, Lab. Supervisor @ 514-381-8684
Contact #2: Tri Vu Truong, Vice President @ 514-381-8684

Uniroyal Chemical Research Labs.
P.O. Box 1120, 120 Huron St.
Guelph
Ontario
N1H 6N3
Contact #1: J.B. Pierce @ 519-822-3790
Contact #2: W.R. Boos @ 519-822-3790

Walker Laboratories
P.O. Box 100, 2800 Townline Road
Thorold
Ontario
L2V 3Y8
Contact #1: Doug DeCoppel, Assistant Manager, R&D @ 416-227-4142
Contact #2: Blake Smith, Manager, R&D @ 416-227-4142

Warner Laboratories/Gould Energy
PO Box 214, Route 53 N, Gallitzin Road
Cresson
PA
16630
Contact #1: Ms. Lori Patney, Chief Chemist @ 814-886-7400
Contact #2: D.R. Wolber, General Manager @ 814-886-7400

TABLE E-4
PARTICIPATING CROWN LABORATORIES

Alberta Res Council,Coal Res.Centre
Bag# 1310, 1 Oil Patch Drive
Devon
Alberta
T0C 1E0
Contact #1: S. Chakrabartty, Senior. Research Officer @ 403-987-8120
Contact #2: N. Das, Head , Air Analyisis @ 403-987-8120

Atomic Energy of Canada Limited
Chalk River Nuclear Labs
Chalk River
Ontario
K0J 1J0
Contact #1: K.I. Burns @ 613-584-3311
Contact #2: J. Gulens @ 613-584-3311

British Columbia Hydro Research
12388 - 88th Avenue
Surrey
B.C.
V3W 7R7
Contact #1: F.T.Bird @ 604-590-7437
Contact #2: D.M. Cartlidge @ 604-590-7439

British Columbia Research
3650 Wesbrook Mall
Vancouver
B.C.
V6S 2L2
Contact #1: Mr. Herd Lanz, Program Leader, Analysis @ 604-224-4331
Contact #2: Dr. Jim McKinley, Organic Chemist @ 604-224-4331

Can. Food Prod. Dev. Centre - MRC
P.O. Box 1240, 810 Phillips Street
Portage la Prairie
Manitoba
R1N 3J9
Contact #1: Joe Hilliard, Analytical Services Manager @ 204-587-7861
Contact #2: Marc Duquay, Chemist @ 204-587-7861

Ind.Tech.Centre, Manitoba Research
1329 Niakwa Road
Winnipeg
Manitoba
R2J 3T4
Contact #1: Dr. Gerald Lypka @ 204-945-6163
Contact #2: Ms. Monica Velpel @ 204-945-8169

TABLE E-4 (CONTINUED)

Ontario Research Foundation
Sheridan Park Research Commun.
Mississauga
Ontario
L5K 1B3
Contact #1: Dr.G.H. Thomas @ 416-822-4111
Contact #2: Duncan K. Smith @ 416-822-4111

Research & Productivity Council
P.O. Box 6000, College Hill Road
Fredericton
New Brunswick
E3B 5H1
Contact #1: Derek R. Kirby @ 506-452-8994
Contact #2: Hua Tan @ 506-452-1396

Saskatchewan Research Council
15 Innovation Blvd.
Saskatoon
Saskatchewan
S7N 2X8
Contact #1: Dr. Gene Smithson, Manager @ 306-933-5439
Contact #2: Dr. Wo Yuen @ 306-933-6935

Whiteshell Nuclear Research Est.
Atomic Energy of Canada Ltd.
Pinawa
Manitoba
R0E 1L0
Contact #1: Dr. B.A. Lange @ 204-753-2311
Contact #2: F.E. Doern @ 204-753-2311

TABLE E-5
PARTICIPATING UNIVERSITY LABORATORIES

Carleton University, Chemistry Dept
Colonel By Drive
Ottawa
Ontario
K1S 5B6
Contact #1: Dr. C.L. Chakrabarti @ 613-564-5685
Contact #2: Dr. D.R. Wiles @ 613-564-4332

Queen's University
Analytical Services Unit (ASU)
Kingston
Ontario
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Contact #1: Dr. John Poland, Director @ 613-545-2642
Contact #2: Dr. John A. Page @ 613-545-2645

Universite de Montreal, Recherche
C.P. 6079,
Montreal
Quebec
H3C 3A7
Contact #1: Victor J. Kubat, Lab Manager @ 514-340-4789
Contact #2: Christian Dallaire, Assist. Manager @ 514-340-4789

TABLE E-6
PARTICIPATING MUNICIPAL LABORATORIES

Easterly Water Treatment Plant
P.O. Box 277,
West Hill
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Contact #1: Mr. K. K. Wong, Chief Chemist @

Island Water Treatment Plant
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Toronto
Ontario
M8V 3M6
Contact #1: Gary Peterson, Chief Chemist @

London City Hall
P.O. Box 5035,
London
Ontario
N6A 4L9
Contact #1: Mr. R.J. Collins, Manager @ 519-661-4587
Contact #2: Mr. G.M. Cox, Chemist @ 519-471-7087

R.C. Harris Water Treatment Plant
c/o 45 23rd Street
Toronto
Ontario
M8V 3M6
Contact #1: John Rudnickas, Chief Chemist @

R.L. Clark Water Treatment Plant
c/o 45 23rd Street
Toronto
Ontario
M8V 3M6
Contact #1: Jim McKergow @ 416-392-2908

RMOC Pollution Control Centre
655 Shefford Road
Gloucester
Ontario
K1J 8G8
Contact #1: J.L Barnwell, Manager @ 613-745-7165
Contact #2: K.D. Stolch, Director @ 613-745-7165

TABLE E-6 (CONTINUED)

Reg. Mun. of Waterloo, Eng. Lab.
RR 31
Cambridge
Ontario
N38 4R6
Contact #1: Dave Andrews, Super. of Technical Services @

Region of Halton
1151 Bronte Road
Oakville
Ontario
L6J 6E1
Contact #1: Kathryn Crow @

Toronto Central Laboratory
45 23rd Street
Toronto
Ontario
M8V 3M6
Contact #1: Peter Sivilia @

Metro Toronto Industrial Waste Lab
30 Dee Avenue
Weston
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Contact #1: Tibor Haasz, Main Treatment Laboratory @ 416-392-5157

Water Supply Division, Works Dept.
495 Richmond Road
Ottawa
Ontario
K2A 4B2
Contact #1: Mr. Boyce Hutcheon, Manager Quality Control @ 613-828-2727
Contact #2: Claude Jackson, Superintendent @ 613-828-2727

Windsor Utilities Commission
3665 Wyandotte Road
Windsor
Ontario
N8Y 1G2
Contact #1: Mr. Jim Fraser, Super. of Water Production @